THE

# JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXVI. No. 917.] LONDON, DECEMBER 7, 1880. [32ND YEAR. Price 6d.

**GAS PURIFICATION**
BY
**OXIDE OF IRON.**

**COOKE BROS.,**
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
ERITH,
OFFICES:
2, CROSBY SQUARE,
LONDON, E.C.

**GENUINE TORBAY PAINT**
**And SPECIAL GASOMETER PAINT.**
SEVERAL PRIZE MEDALS. ESTABLISHED OVER 20 YEARS.
These Paints are now used by all the London Gas Companies and most of the principal Country Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
**TORBAY PAINT COMPANY.**
PROPRIETORS: STEVENS & CO.,
21, GREAT WINCHESTER STREET, LONDON.
WORKS: BRIXHAM, TORBAY.

**TUBES.**
FIRST PRIZE SYDNEY EXHIBITION 1880
Tubes and Fittings for Gas, Steam, Water, and Hydraulic purposes, plain, galvanized, white enamelled inside, or coated by Dr. Angus Smith's process, or oxidized by Prof. Barff's patent process. Gas-fitters tools, brass cocks, &c.
JOHN SPENCER,
VULCAN TUBE WORKS,
WEST BROMWICH, STAFFORDSHIRE,
& 97, CANNON ST., LONDON.

COWEN'S PATENT FIRE-CLAY RETORTS.
**JOSEPH COWEN and CO.,**
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and other OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
JOS. COWEN & Co. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

**JOHN RUSSELL & CO.,**
LIMITED,
*Established at the commencement of Gas Lighting,*
MANUFACTURERS OF
**TUBES AND FITTINGS.**
**THREE PRIZE MEDALS,**
**Paris, 1878.**
HEAD LONDON OFFICE:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

**JOHN BENT & SON,**
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
LICENSEES AND MANUFACTURERS OF
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
ESTABLISHED 1830.

**THOMAS PIGGOTT & CO.,**
SPRING HILL, BIRMINGHAM,
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
*Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.*
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
*Roofs, Girders, and Bridges, and General Smith's Work.*
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
**"OTTO" GAS-ENGINE,**
From ½ to 40 H.P. ind.
See Page 878.
CROSSLEY BROTHERS,
**MANCHESTER AND LONDON.**

THE
DUKE OF HAMILTON'S
**LESMAHAGOW**
**CANNEL COAL,**
AGENT:
**JAMES M'KELVIE,**
HAYMARKET,
EDINBURGH.
ESTABLISHED 1840.

# GEORGE GLOVER AND CO.,

PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
AND MANUFACTURERS OF
**IMPROVED DRY GAS-METERS.**
GOLD MEDAL. HIGHEST AWARD.

INTERNATIONAL EXHIBITION,
SYDNEY, 1880.

RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.
1, LANCASTER AVENUE, MANCHESTER.

Foreign Agents: DAHL BROS., Copenhagen; A. FAAS & CO., Frankfort-on-Maine; W. HOVEN & SON, Rotterdam; COPLAND & M'LAREN, Montreal; A. DEMPSTER, 57, Elizabeth Street, Melbourne.

# WELLINGTON TUBE WORKS,

**GREAT BRIDGE, TIPTON, STAFFORDSHIRE.**

## JOSEPH AIRD,

**GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.**

## DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

**WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),**

MANUFACTURER OF

## TELESCOPIC AND SINGLE GASHOLDERS,

**WROUGHT AND CAST-IRON TANKS FOR DITTO.**

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

**WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.**

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

**Drawings, Specifications, and Estimates supplied on application.**

## GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

**FOUNDRY AND GENERAL BRASS WORKS, ROTHERHAM;**

**AND 5, SOUTHWARK ST., LONDON, S.E.**

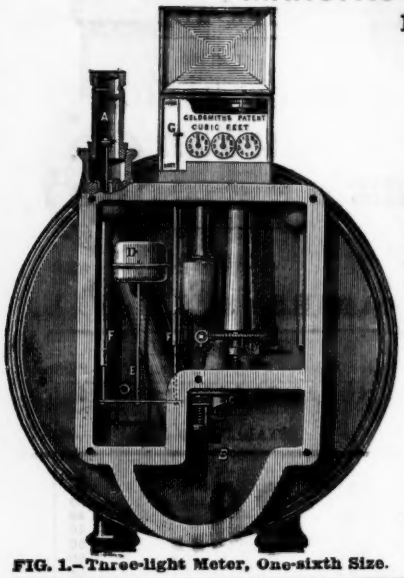



FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

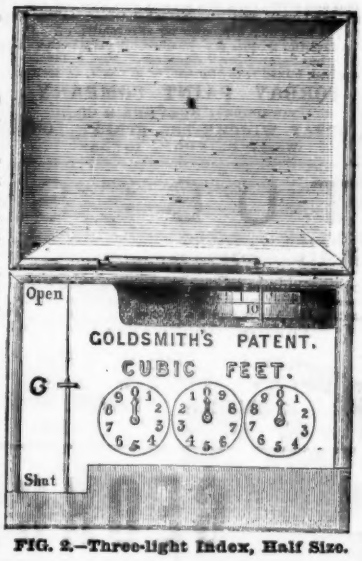



FIG. 2.—Three-light Index, Half Size.

TRADE MARK.

**THE MEDAL FOR 1862.**

**The only Prize Medal awarded for TUBES & FITTINGS.**

## CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

**WAREHOUSE: SOUTHWARK STREET, LONDON.**

## JAMES RUSSELL & SONS, LIMITED,

**PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,**

**ONLY MAKERS OF HOMOGENEOUS METAL TUBES.**

MANUFACTURERS OF

**TUBES and FITTINGS for GAS, STEAM, and WATER;**

**LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;**

**HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.,**

**GAS-FITTERS TOOLS, VALVES, COCKS, &c.**

# THOMAS PIGGOTT & CO.,

(Established 1822,)

## SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

## TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

**PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;**

**IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;**

AND GAS APPARATUS OF EVERY DESCRIPTION.

**SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,**

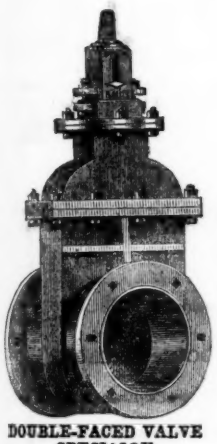
By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder or ingress of atmospheric air.

**ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.**

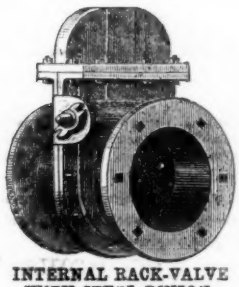
Drawings, Specifications, and Estimates supplied on application.

LONDON OFFICES: 97, CANNON STREET—JAMES E. & SAMUEL SPENCER, AGENTS.

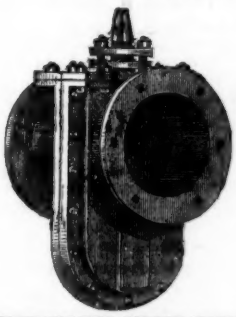
## C. & W. WALKERS' GAS-VALVES.



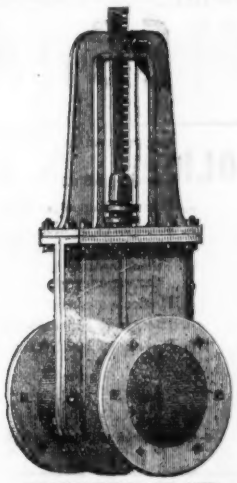
DOUBLE-FACED VALVE SPECIALLY FOR PURIFIERS.



INTERNAL RACK-VALVE WITH STEEL PINION, FOR GENERAL USE.



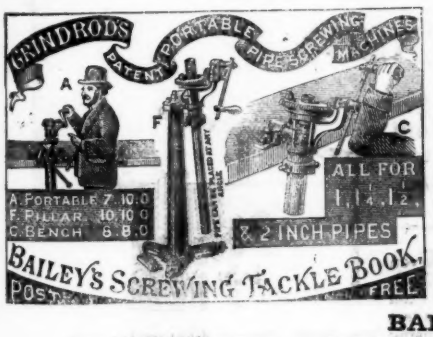
UNDERGROUND SCREW-VALVE FOR SHALLOW STREET-MAINS.



ORDINARY RACK AND PINION VALVE.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.



BAILEY'S FLY WHEEL STEAM PUMPS
SIMPLE & STRONG
WITH NO MYSTERIOUS VALVES.
W.H. BAILEY & Co. HYDRAULIC ENGINEERS.
ALBION WORKS, SALFORD, MANCHESTER.

**Prices of Bailey's Double-Acting Steam-Pumps.**

| No. | Diameter of Steam Cylinder. | Diameter of Pump. | Length of Stroke. | Gallons pr. Hour. Approx. | Price. |
|---|---|---|---|---|---|
| | Inches. | Inches. | Inches. | At Slow Speed. | £ |
| A 1 | 4 | 2 | 6 | 850 | 18 |
| B 2 | 6 | 3 | 10 | 1,940 | 25 |
| C 3 | 6 | 4 | 10 | 2,600 | 30 |
| D 4 | 8 | 4 | 10 | 3,150 | 40 |
| E 5 | 6 | 6 | 10 | 7,200 | 40 |
| F 6 | 8 | 6 | 10 | 7,200 | 50 |
| G 7 | 10 | 6 | 12 | 7,200 | 60 |
| H 8 | 8 | 8 | 10 | 14,000 | 65 |
| I 9 | 10 | 8 | 12 | 14,000 | 75 |
| K 10 | 12 | 8 | 15 | 14,600 | 100 |
| | 10 | 10 | 15 | 21,000 | 110 |
| | 12 | 10 | 15 | 21,000 | 125 |

NOTE.—*At quick speed these pumps will generally deliver double the quantity specified.*

**BAILEY'S HOT-AIR ENGINES,**

From ¼-horse to 4-horse Power. Particulars on application. We also make Hot-Air Pumping Engines, and every description of Hydraulic Work.

W. H. BAILEY & CO., ALBION WORKS, SALFORD, MANCHESTER.

# ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

**ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.**

MANUFACTURERS OF EVERY DESCRIPTION OF

## GAS APPARATUS;

CONTRACTORS FOR THE

**ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.**

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

# GAS PURIFICATION
BY
## OXIDE OF IRON.
## GAS PURIFICATION & CHEMICAL Co., LIMITED,
**PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.**

**JOHN WM. O'NEILL, Managing Director.**

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## GAS *v.* ELECTRIC LIGHT.
## WIGHAM'S PATENT LIGHTHOUSE GAS-BURNERS,
**For Street Lighting and the Illumination of Large Halls, Factories, Ship Yards, &c., where Powerful Light is required**

These Burners have been adopted by a School Board, having large school-rooms in charge, because of their high illuminating power and the facilities they give for perfect ventilation. The actinic power of these Burners is such that they are used successfully for Photography and Photo-Lithography.

**SOLE MANUFACTURERS:**

**J. EDMUNDSON & CO., Gas Engineers, 19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.**

---

# MECHANICAL CONDENSATION.

The undersigned has arranged with Messrs. Pelouze and Audouin the exclusive agency for their patented system of Condensation, in Great Britain and the Colonies.

The following are some of the advantages which this philosophic mode of arresting liquefiable vapours possesses:—

1. It acts irrespective of temperature.
2. It requires no motive power, but automatically adapts itself to production.
3. It may be fixed directly after the hydraulic main, by which prolonged contact of the gas with tar is avoided, and the highest standard of illuminating power is obtained which the coal is capable of giving; or it may be fixed directly after an ordinary air condenser, when it will arrest the vapoury globules which cooling alone will not stop, and the production of tar and ammonia water is thereby increased.
4. It effects a considerable saving in purification, through no tar getting to the material to clog its action.
5. It entirely supersedes the necessity of scrubbers; and if wet sawdust be used in a purifier, washers also are unnecessary.
6. It occupies but little space, and avoids that which is now considered a disadvantage—the too much cooling, scrubbing, and washing of gas.

Further particulars may be obtained of

**GEO. BOWER, St. Neots, Hunts.**

NOTE.—*Gas-works contracted for complete, or apparatus supplied in detail from the retort to the burner. "The Gas and Water Engineer's Book of Reference," post free, 5s. "Handy Abstract of the Public Health Act, 1875," post free, 1s.*

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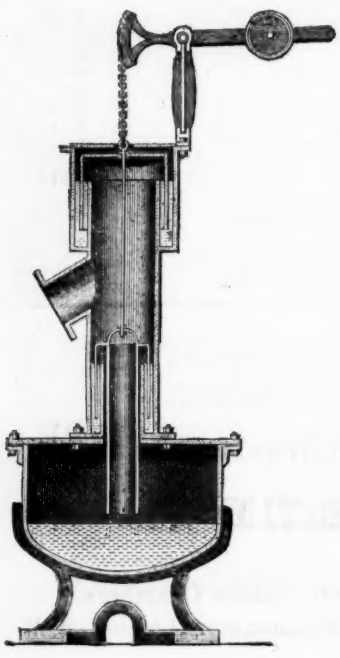
# SELF-ACTING REMOVABLE DIP-PIPE,
PATENTED BY
## CHANDLER & STEVENSON.



**The following Testimonials, as to five years constant working of this Patent Removable Dip, have been received:—**

*Metropolitan District Asylum Gas-Works, Caterham, Surrey, Jan. 15, 1874.*

MESSRS. CHANDLER and SONS.

DEAR SIRS,

In reply to your inquiries, I beg to inform you that since I have used your Patented Dips (ten in number), I find my make has increased over 1000 cubic feet per ton of coal carbonized, my usual make being 9070 cubic feet before using your Dips, and 10,150 cubic feet since using them.

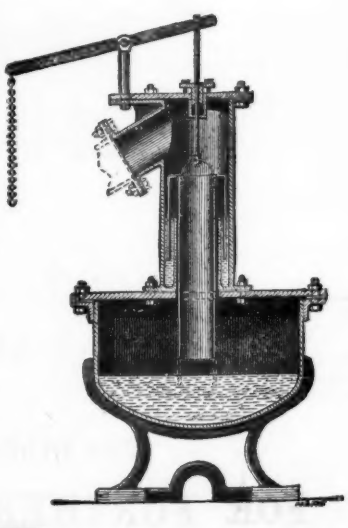
*Metropolitan District Asylum Gas-Works, Caterham, Surrey, Dec. 30, 1879.*

MESSRS. CHANDLER and SONS.

DEAR SIRS,

In reply to your inquiry, it is with very much pleasure thatI endorse every word of my letter of Jan. 15, 1874; and I may add that from the date the Patent Dips were fitted, they have worked perfectly, and there is very little carbon deposited in the retorts, in consequence of the lower pressure.

Yours faithfully,
(Signed) W. CRICKMAY,
Memb. Soc. Engineers.



APPLICATIONS TO BE MADE TO

**Messrs. CHANDLER & SONS,**
**104, NEWINGTON CAUSEWAY, S.E.**

# KIRKHAM, HULETT, & CHANDLER, LIMITED.

## PATENT "STANDARD" WASHER-SCRUBBER,

FOR

# GAS PURIFICATION,

**TAKES OUT EVERY TRACE OF AMMONIA AND A LARGE QUANTITY OF CARBONIC ACID AND SULPHURETTED HYDROGEN BY ONCE PASSING THROUGH THE MACHINE.**

**AMMONIACAL LIQUOR OBTAINED OF ANY REQUIRED STRENGTH.**

**The Cost of the Machine defrayed by the Ammonia obtained in Twelve Months. It requires very little attention, and cannot get out of order.**

**These Machines, which contain from 3200 feet to 65,000 feet of Wetted Surface, are supplied to the following Gas-Works:—**

| | Feet per Day. | | Feet per Day. | | Feet per Day |
|---|---|---|---|---|---|
| The Gaslight Company— | | | | | |
| Beckton | 7,500,000 | Leeds Corporation | 14,000,000 | West Bromwich Improvement Commissioners | 1,000,000 |
| Bromley | 7,000,000 | Leominster Company | 150,000 | Radcliffe and Pilkington Co. | 750,000 |
| St. Pancras | 3,000,000 | Maidstone Company | 1,000,000 | Falmouth Company | 150,000 |
| Shoreditch | 2,500,000 | South Metropolitan Company, Greenwich | 2,500,000 | European Company, Rouen | 250,000 |
| Bradford Corporation | 1,000,000 | Ditto, Vauxhall | 3,000,000 | Deal Company | 200,000 |
| Bremen Company, Germany | 150,000 | Woolwich Equitable Company | 400,000 | Leyden Company, Holland | 560,000 |
| Dukinfield Local Board | 500,000 | Yeadon Company | 500,000 | Kingston-upon-Hull Company | 400,000 |
| Driffield Company | 100,000 | Salford Corporation | 5,250,000 | Ilkeston Local Board | 250,000 |
| Goole Company | 250,000 | London Gas Co., Nine Elms | 3,000,000 | Dover Company | 750,000 |
| Glossop Company | 300,000 | Nottingham Corporation | 1,250,000 | Frankfort Company | 300,000 |
| Holywood Company, Ireland | 125,000 | Cheltenham Company | 2,000,000 | Huy, Belgium | 70,000 |
| Heywood Local Board | 600,000 | | | | |

**Washers in course of Construction—**

| | Feet per Day. | | Feet per Day. | | Feet per Day. |
|---|---|---|---|---|---|
| Yeovil Company | 250,000 | Oldbury Local Board | 500,000 | Newport, U.S.A. | 250,000 |
| S. Metropolitan Co., Vauxhall. | 3,000,000 | Altrincham Company | 600,000 | Ramsgate Local Board | 1,000,000 |
| erby Company | 1,500,000 | Cannes, France | 200,000 | Sydney Company | 1,000,000 |

## TESTIMONIALS.

Messrs. Kirkham and Hersey. *The Gaslight and Coke Company, Beckton, North Woolwich, June 8, 1880.*

Gentlemen,—I enclose you some particulars of the working of your Washers here, and I intend having some more experiments made, as just now we are working the first Washer with liquor, and the second with water. Of course the fact of our having ordered two more in addition to the four which we have in use is a sufficient indication of my opinion of the value of the Washer. (Signed) G. C. TREWBY.

Messrs. Kirkham and Hersey. *25, Palace Chambers, Bridge Street, Westminster, S.W., July 19, 1880.*

Dear Sirs,—The "Standard" Washer which you supplied for use at the Vauxhall station of the Phœnix Gaslight Company afforded me entire satisfaction. It was designed to remove the ammonia from 3 million cubic feet of gas per day, and during the past winter it did so with a good working margin to spare. It is as excellent now in workmanship as in design, and is well worthy the general acceptance with which it appears to be meeting. I am, faithfully yours, (Signed) CORBET WOODALL.

Messrs. Kirkham and Hersey. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Aug. 12, 1879.*

Gentlemen,—In reply to your inquiry, one of your Patent Scrubber-Washers to purify 100,000 cubic feet per hour was put into operation at these works on the 1st of June. At the same moment the whole of our Scrubbers, equal to 28,000 cubic feet, were thrown out of use, leaving your Washer the whole work of freeing the gas from Ammonia. This it has done to perfection up to date. With 10 gallons of water to each ton of coal carbonized passing through it we get a clean test at the seventh chamber, leaving four chambers margin for extra work. The mean quantity of Ammonia in the inlet (fixed and free), obtained from a large number of tests, was 241 grains per 100 feet of gas. On the outlet—Free Ammonia—Nil. The quantity of water used is 10 gallons per ton of coal carbonized. The strength of liquor as follows:—

| Chamber No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Strength of liquor—ounces | Nil. | Nil. | Nil. | Nil. | 0·4 | 1·0 | 2·2 | 3·5 | 5·5 | 8·25 | 12·5 |

We are working five revolutions per minute. It takes out all the free Ammonia, reduces the carbonic acid and sulphuretted hydrogen 30 per cent., requires a very small amount of power to drive, and altogether is, in my opinion, the best machine for the purpose yet invented, and will, I feel confident, ere long, entirely supersede the Scrubbers of to-day. I am glad to find you are going to fix one of these Washers at our Vauxhall works. (Signed) P. J. WATES, Engineer.

**For other Testimonials, see next week's Journal.**

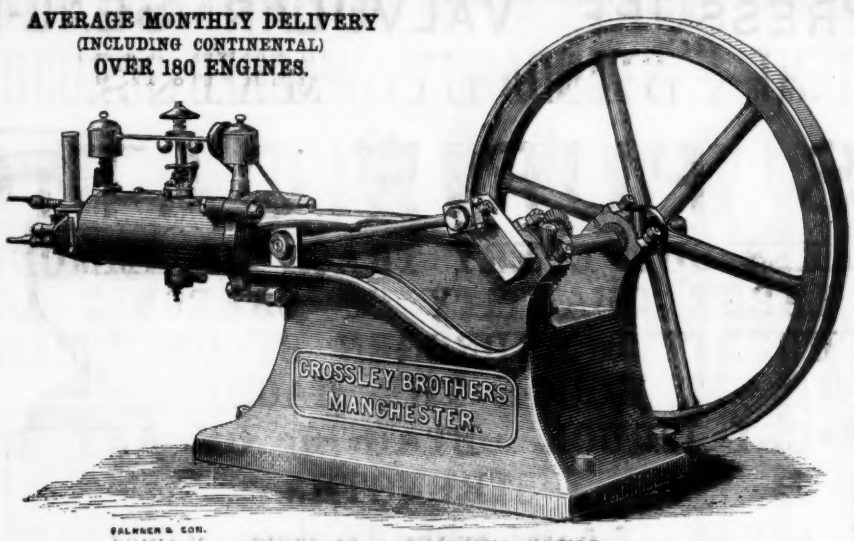
**FOR FURTHER PARTICULARS AND TESTIMONIALS, ADDRESS MESSRS.**

**KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.**

# AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

These Engines are used at the following Gas-Works:—Birmingham, Brentford, Bucharest, Bishop Stortford, Driffield, Dundalk, Dundee, Dublin, Huddersfield, Hinckley. London—London Gas-Works, Phœnix Gas Co., Gaslight and Coke Co., South Metropolitan Gas Co., Commercial Gas Co., Crystal Palace District. Leominster, Edinburgh and Leith, Ludlow Union, Lancaster, Maidstone, Nuneaton, Northampton, Shanghai, Sheffield, Worcester, Wantage, &c.

AVERAGE MONTHLY DELIVERY
(INCLUDING CONTINENTAL)
OVER 180 ENGINES.




Over 2500 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

## THE "OTTO" SILENT GAS-ENGINE,

### From ½ to 40 Horse Power Indicated.

(Otto and Crossley's Patents, 1876 and 1877.)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. CASES NOT CHARGED IF RETURNED FREE.

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

WORKS AND HEAD OFFICES:
Gt. Marlbro' St., Gloster St.

## CROSSLEY BROTHERS,
MANCHESTER.

LONDON HOUSE:
116, Queen Victoria St., E.C.

## WARNER'S RETORT-HOUSE MACHINERY.

[*As Illustrated and Described in the* JOURNAL *for May* 4.]

Communications to be addressed to

W. J. WARNER, GAS-WORKS, SOUTH SHIELDS.

NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!

## G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

## PARIS EXHIBITION, 1878.

## THREE MEDALS
AND
HONOURABLE MENTION
HAVE BEEN AWARDED TO
## JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

SILVER MEDAL
FOR THEIR
PATENT MACHINE-MADE
RETORTS AND FIRE-BRICKS,
Being the Highest Honour given for this class.

Established

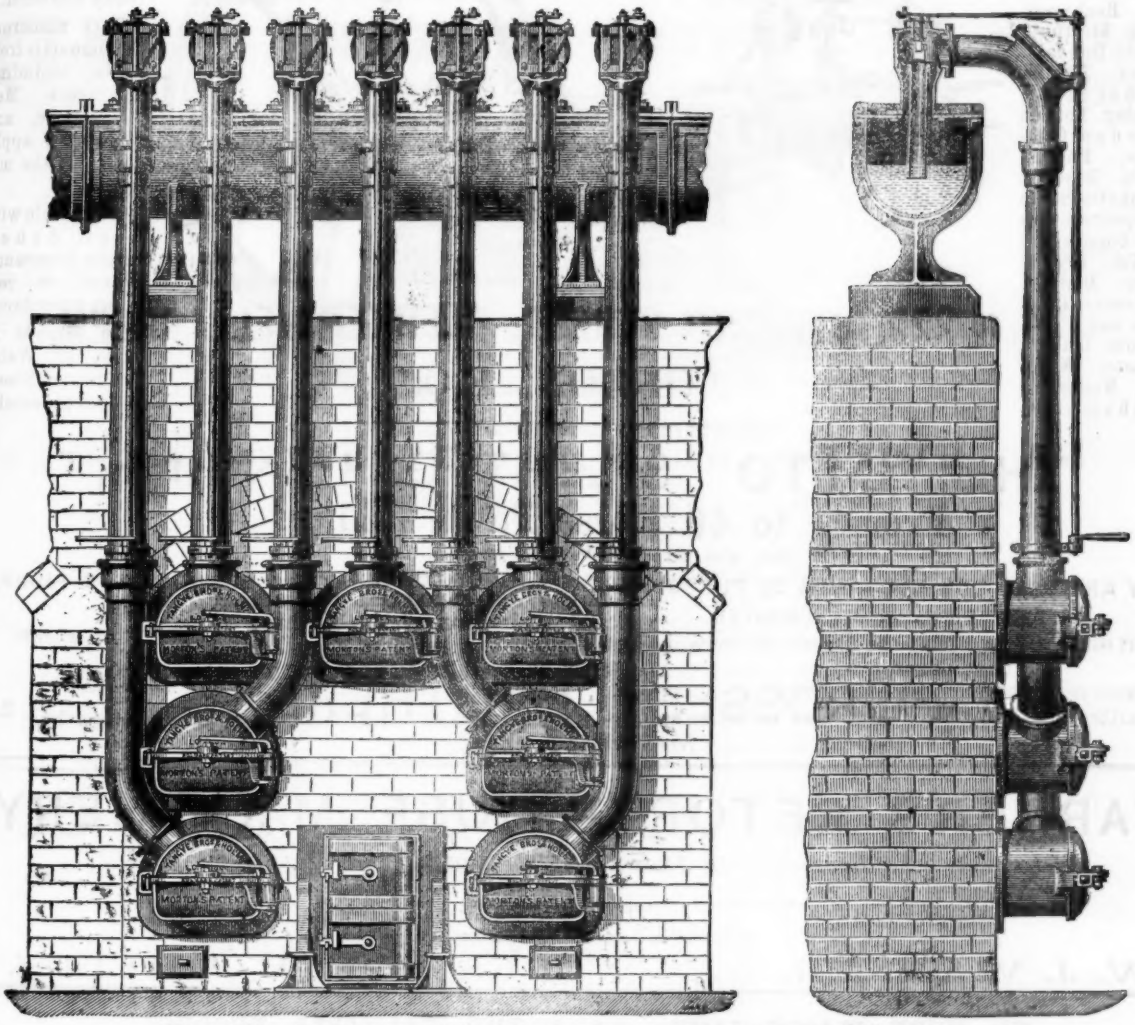
1795.

## JOSEPH CLIFF & SONS,
THE ORIGINAL
WORTLEY FIRE-BRICK WORKS,
NEAR LEEDS,

London Wharf: No. 4 inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

# HOLMAN'S PATENT
# NON-PRESSURE VALVULAR SEAL-PIPES
FOR
# HYDRAULIC MAINS.



**The salient features of the above arrangement are as follows:—**

1. The Seal is instantaneously opened and closed from the stage by the stokers.
2. There are only two positions for the actuating lever: one when the Seal is opened during the period of carbonization, the other when it is closed for drawing and charging the retort.
3. The retort can never be blocked, beause the port directing the gas *through* the Seal is always opened, and the port permitting the gas to *pass* the Seal *direct* into the hydraulic main is also open while the retort is at work.
4. The manager and stokers can always see at a glance, by the position of the lever, whether the retort is duly unsealed while carbonizing its charge.
5. There are no extraneous seals, stuffing-boxes, hinges, screws, chains, pulleys, springs, teeth, or other complication belonging to the valves; they are made plain and strong for rough use, and will last many years without renewal.
6. The valve faces are always covered and never separated, hence no foreign matter can put them out of action.
7. They are positive, reliable, interchangeable, free from all the uncertainty of automatic arrangements, and low in price.
8. No extra pipes or connections are required, because the Valvular Seal-pipe is self-contained in the single branch of the ascension-pipe, which stands on the hydraulic main, and is easily accessible by removing an ordinary cover secured by two bolts only.

(238) TWO HUNDRED AND THIRTY-EIGHT HOLMAN'S PATENT VALVULAR SEAL-PIPES are being fitted to the Hydraulic Mains at the Radford Station of the Corporation Gas-Works at Nottingham.

(84) EIGHTY-FOUR more are being fitted to the Mains in the New Retort-House of the Gas-Works at Brentford, and they can be readily applied to existing Hydraulic Mains generally.

They are to be fitted to the Hydraulic Mains of the New Retort-House at the LONDON GAS-WORKS, and at other large stations.

Mr. MORTON writes in the following terms, under date of Feb. 3, 1880:—

"Gentlemen,—I have determined to use your HOLMAN'S PATENT NON-PRESSURE VALVULAR SEAL-PIPES in our new Retort-House. Will you, in the meantime, send me, as soon as you can, four as you are now making them. I expect to hear of a large demand for these Pipes. I like the idea of always maintaining passage through an ordinary dip."

ESTIMATES for Retort Work, including Mouthpieces fitted with Morton's Patent Self-Sealing Lids and Holman's Self-Sustaining Cross-Bars and Fastenings, Hydraulic Mains and Ascension-Pipes, fitted with Holman's Patent Non-Pressure Valvular Seal-Pipes complete (as per accompanying illustration), will be forwarded to Engineers on receipt of particulars of intended erections, or re-setting of Retorts during the current or ensuing season.

Engineers preparing Specifications will be furnished with Tracings and all necessary data on application.

**Sole Makers:**

## TANGYE BROTHERS AND HOLMAN,
HYDRAULIC AND GAS ENGINEERS,
**CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.**

London, 1862. New York, 1863. Paris, 1855. London, 1862.

Dublin, 1865 Paris 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

**PATENT DRY GAS-METERS,**

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

# THOMAS GLOVER & CO.,

## DRY GAS-METER MANUFACTURERS,

## 214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

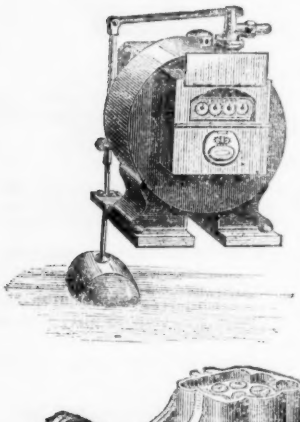
## LONDON, E.C.

### THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

# WILLIAM PARKINSON AND CO.

(ESTABLISHED 1816.)



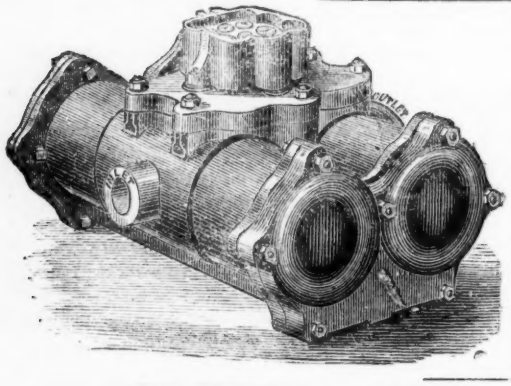
### LOW-PRESSURE WATER-METER.

This Meter will register with perfect accuracy, either at full speed, or with a few drops only passing through it.

It must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below.

Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply a the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



### HIGH-PRESSURE WATER-METER.

The Union Water-Meter, of which an external view is here given, is of the positive class—*i.e.*, a Meter in which a measuring chamber is alternately filled and emptied, each filling being duly recorded. It is formed of two cylinders, with double pistons in each, having a rotary-valve of peculiar construction, which is worked from cams on the piston-rods.

It is claimed for this Meter, among its advantages over other Piston Meters in use, that it is extremely small and compact, and that its durability and accuracy have been proved by the fact that upwards of 20,000 of them, of various sizes, are in successful operation in the States. In England the instrument has been fully tested by several Water Engineers of eminence, and pronounced by them as a reliable and satisfactory register of water supply; it is also economical in cost.

**ALL METERS are TESTED with 60 lbs. pressure before they are sent out.**

## COTTAGE LANE, CITY ROAD, LONDON, E.C.

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## TO CORRESPONDENTS.

R. B.—*Will write you privately, in the course of the week, on the subject of your letter.*

A Country Manager.—*No positive rule can be held to apply in all cases. The relative proportions of the two materials must be determined, in each individual case, by economy, and by due regard to the restrictions under which the manager works. You may soon satisfy yourself by carrying out a series of careful but simple experiments.*

One who wishes to Use It (Newport, Mon.)—*The facts of the case, as reported, are so vague that no benefit, from a scientific point of view, could be derived from their discussion. If, however, you can supply any authentic details and will comply with our rule as to furnishing your name and address (see below), we may be able to refer to the matter.*

One in Doubt.—(1) *You are not bound to carry a service-pipe beyond* 50 *yards from an existing main; but up to that point the expense of doing so must be borne by the Company.* (2) *Yes.* (3) *The charge must not exceed the lowest price paid by ordinary consumers.* (4) *The Company.*

*No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.*


# THE JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

*TUESDAY, DECEMBER* 7, 1880.


## Circular to Gas Companies.

The eventful thirtieth of November has come and gone once more, and we are now able to tell who intend, through the Private Bill Office, to consult the parliamentary oracle during the forthcoming session. Such is the flight of time that the present number of the Journal, which contains the last instalment of our abstracts of the private Acts relating to gas and water passed in the course of the last sessions, also contains the list of applications to be made next year for parliamentary powers in the same departments of British enterprise. It is impossible to prophesy how many and which of the measures now proposed will live through the perils of the session, and be reprinted next autumn with the coveted endorsement notifying that the Act has become part and parcel of the law of the realm. Some, we know, will certainly fall short of this desired consummation, but beyond this we do not wish to penetrate the hidden future. Meanwhile, we may profitably place on record a few facts respecting the notices actually given with particular reference to gas undertakings only.

Twenty-four new Bills, and fifteen Provisional Orders, referring either wholly or in part to gas, are promised for next year, as compared with the total of twenty-nine gas notices deposited last year. There is a large increase in the number of Orders applied for in comparison with the past year, which we presume may be taken to mean an increasing disposition on the part of Companies and Local Authorities to avoid strife, and consequently be enabled to procure, at the cheapest rate, the legislative sanction they need. Seven Companies are desirous of being incorporated by Bill, of which nearly all must look for strong opposition. Two of these (relating to Westbury-upon-Trym) are referred to in another part of the "Circular," and we need only mention the fact that there are two Bills and one Order relating to Woking, Surrey, to indicate that there also the elements of strife exist. We have already referred to the threatened opposition to the Thanet Bill, by a Company promoted by Mr. Davis, and the only other Companies giving notice of incorporation are Alnwick and Hexham, both in Northumberland, and both desiring power to supply the electric light. Eight incorporated companies require additional powers, for which they apply for Acts, none, however, of any note that has not been already noticed in these columns. Four Local Authorities proceed by Bill for the acquisition of gas-works, including the Lincoln Corporation, who have already concluded an agreement with the Gas Company; the Goole hybrid Company, of which mention has frequently been made; the Irvine Burgh, as to which it is not very apparent why the Authority did not elect to proceed under the Scotch Burghs Act; and the Bray Township, who contemplate the purchase of the local section of the undertaking of the Alliance and Dublin Consumers Gas Company. Only two Corporations—Birkenhead and Arbroath—elect to proceed by Bill for further powers with respect to gas. Five Corporations give notice of miscellaneous Bills relating to lighting, in four instances taking the opportunity of inserting provisions for the supply of the electric light.

There is a goodly crop of notices for Orders by the Board of Trade; in only one case, however—that of Woking and Horsell, already mentioned—does a Company seek incorporation by this means. Twelve Companies and gas-works proprietors seek confirmation and extension of powers in this way, and, in the case of Northfleet and Greenhithe, ask for authority to amalgamate. The Corporation of Bolton intend to apply for a Local Government Board Order for power to extend their undertaking, thus solving the difficulty recently alluded to in our columns. The Bridgnorth Local Board are singular in their proposed application to the Local Government Board for power to acquire the gas undertaking of the local Company.

There is nothing very remarkable in these notices, if exception is made of the proposed South Metropolitan Bill, and one or two others noticeable for their unconformity with the usual conditions. It is instructive to note that the Aberdeen Corporation are applying for leave to reduce the illuminating power of their gas, which at present stands highest in the kingdom, at an average of thirty candles, and is sold for 4s. 2d. per thousand cubic feet. The Corporation probably find the "game" is literally "not worth the candle," when the power is kept up to such a point, and they are quite justified in endeavouring to rid themselves of ridiculous requirements in this respect. On the whole, it may be expected that next year the Committee-rooms will be the scenes of not a few lively conflicts, and, perhaps, of more than one fierce struggle for existence.

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As stated above, competing notices appeared in the *Gazette* respecting the gas supply of Westbury-upon-Trym, a district on the River Avon, below Bristol. The existing Company desire to be reincorporated with parliamentary powers for the supply of "gas or inflammable air" to so much of the parish of Westbury-upon-Trym as lies in the county of Gloucester, excluding therefrom the Bristol United Gaslight Company, who at present have power over a part of the same district, which, however, they have never exercised. The clause of the notice referring to the powers of the proposed incorporated Company is remarkably extended, including the sale of coal, peat, oil, and sundry other matters connected with the "manufacture of air or inflammable gases." The Company evidently do not intend to be out of court whenever it shall become fashionable to make gas from strange materials, although it may be hoped they will never be called upon to sell "air" to a population suffering from a lack of that essential.

The opposing scheme contemplates the supply of gas to

the parish of Henbury, as well as to part of Westbury. The whole of the Gloucestershire portion of the parish of Westbury-upon-Trym is not to be included in the limits to be defined by this Bill. It will thus be seen the districts of the two Bills under the same heading in the published notices are not strictly the same, but they approximate sufficiently to be in serious conflict. The locality is a fairly promising one for a gas undertaking in an ordinary business sense; but whether it is worth a costly struggle in Parliament is another matter, which must be left for decision to the parties concerned.

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Light has furnished much instructive entertainment to London lecture-goers during the past fortnight. Professor Graham Bell's lecture on the photophone before the Society of Arts on Wednesday was largely attended, and the learned Professor received the honours so justly due to him for his painstaking research. With respect to the instrument which furnished the title of the lecture, not much could be demonstrated, but the chief interest of Professor Bell's discourse was in connection with the illustration of the central principle—the variation in electrical conductivity of selenium in light and darkness—in some of its developments. It has even now become general belief that the photophone itself, although one of the most striking and original, is perhaps not the most important example of the extent to which the curious physical phenomenon in question is capable of useful application, in the improved form in which it is treated by Professor Bell. Dr. C. W. Siemens came forward on this occasion with an account of his "selenium eye," constructed originally for use as a photometer, but since consigned to the South Kensington Museum as a curiosity. In connection with this particular opening for the utilization of selenium, it does not appear at all rash to expect that a combination of Dr. Siemens's "eye," with an ear adapted to assign definite values to the tones of Professor Bell's resonant instrument, would result in the production of something of the nature of a mechanical photometer.

The other recent sensation is, of course, Mr. J. W. Swan's incandescent lamp, which was shown by the inventor before the Society of Telegraph Engineers last Wednesday week, to a crowded and enthusiastic audience. The beauty of the light was much admired, but, as might be imagined, Mr. A. Siemens and Mr. Crompton, both representing the arc-light interest, viewed the lamp with almost as much jealousy as though they had been gas engineers. The latter division of spectators did not introduce any discordant notes into the general chorus of congratulation addressed to the clever lecturer, but it is not to be supposed they were, on that account, altogether disheartened. The probable cost of the light, including that of the renewal of the carbon wires at intervals, has not yet been given authoritatively, so we really have very little to go upon when attempting to estimate the practical utility of Mr. Swan's invention. After a few more lectures have been given on the incandescent lamp, we may expect to hear of something by way of a Company, with a few millions of share capital, to apply the system to general use. Meanwhile, there is much gnashing of teeth across the Atlantic, among the friends of Mr. T. A. Edison, who have by this time received the full particulars of Mr. Swan's first lecture at Newcastle, and are excusably furious at his presumption in claiming to have anticipated the great American in his most be-puffed invention. We may be sure that much ink will flow in bitter controversy on the important point as to who was first, unless Mr. Swan takes up his position firmly on the facts, and declines to discuss the matter any further. We are not much concerned for the honour of the English or the American inventor, having had sufficient experience of the wisdom of waiting for proofs of the expected success to be furnished by every-day practice, before hastening to ascribe praise to one man or another.

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One of the results of freeing the Metropolitan Bridges from toll has been a dispute between the Metropolitan Board of Works and the London Gaslight Company, which culminated in an action between the parties, tried by Justices Field and Manisty in the Queen's Bench Division on Tuesday last. The facts of the case are very simple. The London Gaslight Company had an agreement with the Company of Proprietors of Waterloo Bridge, whereby their gas-mains might be carried over and along the bridge, in consideration of an annual payment of £150 made at the office of the Bridge Company. By the Toll Bridges Act of 1877 it was enacted that the Metropolitan Board should acquire the bridge with a view to its being thrown open, free of toll, for the benefit of the public. The Board consequently paid £475,000 for the bridge and its approaches, whereupon the use of the roadway was immediately opened for free traffic. The actual structure of the bridge and the thoroughfare over it remained vested in the Board, while the northern and southern approaches were handed over to the care of the authorities of the parishes in which they respectively lay. As soon as the bridge became public property, the Gas Company ceased to pay the annual tribute before mentioned, declining to recognize the Metropolitan Board as the residuary legatees of the Bridge Company, and contending that by the Gas-Works Clauses Act they were entitled to break open any public street or bridge for the purpose of laying pipes therein. The Metropolitan Board asserted their right to receive the money, alleging that the agreement in question was part of the "undertaking" of the Bridge Company for which they had paid the lump sum already referred to, and they accordingly took proceedings to compel payment by the defaulting Gas Company. Judgment was, however, given for the Company by Justice Field, with the full concurrence of Justice Manisty. The learned judges held that there was not any specific or implied provision in the Toll Bridges Act to the effect that the contract should be transferred to the Board. Even if the contract could be held to remain in force with regard to the Gas Company, notwithstanding the demise of the Bridge Company, it did not appear that the Metropolitan Board, merely retaining the roadway over the Bridge itself, could lay claim to a payment that originally also covered the approaches, which had been apportioned to other bodies. Moreover, the Act under which the property became vested in the Board was a public Act, and its provisions must be construed in the public interest and in the sense of a general Act; it was not a private measure intended to settle the claims of two contending contractors. The Counsel for the Board having laid stress upon a section of the Act specially protecting the London Gaslight Company, and having argued that the Company could not escape from all obligations in respect of the rights thus specifically reserved, the judge remarked that as the clause was introduced for the advantage of the Company, they might waive the conditions intended for their own benefit, and then the clause could not apply. The Company were accordingly victorious on every point, and the Metropolitan Board have been taught that they cannot charge toll to one alone of all the users of an enfranchised bridge.

At last there is a promise of cheaper gas at Rochdale. An invoice price of 3s. 11d., reduced for cash to 3s. 9d. and 3s. 6d. per thousand cubic feet to small and large consumers respectively, is certainly unjustifiable for such a locality, and the intended reduction of threepence per thousand feet is nothing remarkable. It ought to have been granted long ago, and in that case there would still have been the opportunity, as at present, of making a reduction to date from the commencement of next year. There is a strong local feeling against the existing rates, and a growing party in the Council has for some considerable time sought to make the practice of the Gas Committee of Rochdale follow the example of those towns where gas consumers are not drawn upon for the relief of ratepayers. To this party, to whose efforts we wish every success, even the present small reduction is consolatory, especially as it was resisted by a respectable minority, headed by the Mayor, and the consent of the Council was only obtained as the result of a division in which the party of "indirect taxation" was signally defeated. The debate in the Council meeting of Thursday last upon the minutes of the Gas Committee was remarkable for several examples of direct appeals *ad hominem*, and the two divergent principles of cheap gas and honest rating, and dear gas with relief of rates, found many personal illustrators on both sides. Local parliaments are not bound to be logical, or it would now be impossible for the Rochdale Council to resist an immediate motion to sell gas at cost price. All the arguments of the victorious majority would be as applicable to that proposal as to a temporizing reduction of the selling price, and having approved of the policy of cheap gas when the fundamental issue was clearly before them, we should not be surprised if, after a little time for the completion of their education, this course is admitted in yet another Yorkshire town as the only rational means of distributing local taxation.

The last meeting of the Manchester District Institution of Gas Engineers, under the presidency of Mr. Carr, of Halifax, was held on Saturday, the 27th ult., when Mr. Chew, of Blackpool, was elected President for the ensuing year. For two years in succession the occupants of the chair at these meetings have been popular and thoroughly representative

men, and to this must be ascribed no small portion of the success that has, during this period, attended the work of the Institution. Mr. Chew will have no difficulty in upholding the standard set by his predecessors, and from what he has already shown of his power of keeping abreast of modern progress, his tenure of office should not be marked with any excess of dulness. The late meeting was well attended, and there were several papers read, which will be presented to our readers in the ordinary course. The outgoing President gave a *résumé* of the proceedings of his year of office, marked by his usual breadth of view, and the entire proceedings were fully up to the average of interest.

We commend to the attention of those of our readers who are interested in the development of the lighting power of gas for the purposes of what we must call intense illumination, for want of a better term, to the account of Herr F. Siemens's new regenerative gas-lamps to be found in another column. The principle upon which Herr Siemens has elected to chiefly depend in his efforts to improve the illuminating power of gas by physical means, is far from novel. The fact that hot air increases the brilliancy of flame is quite rudimentary, but doubts have repeatedly been expressed as to whether the possible gain to the power of such a small light as that of an ordinary gas-jet, as might be effected by supplying it with heated air, is sufficient to compensate for the cost and difficulty of the application. So recently as the last meeting of the British Association at Swansea, a report on gas-burners was presented by a Sub-Committee of that body, which attempted to answer the question in the negative. It did not enter into the minds of the reporters that the gas might be made to supply the necessary heat by its own combustion, instead of sending that part of its energy into the atmosphere as a waste, and frequently objectionable, product. It is well known that in some cases it is desirable to adopt more or less expensive devices for the mere purpose of getting rid of the products of the combustion of gas, with no idea of utilizing their heat. It is claimed for Herr Siemens that he has succeeded in combining both these desirable operations in his new lamps, and to such effect that he has left far behind all other forms of gas-burners of which we have any knowledge. Herr Siemens's claims and the testimony of his friends are sure to be sharply examined by those who are eminently qualified to determine their real value, and to this ordeal we must now leave the enthusiastic inventor. The particular lamps referred to may or may not be the great success announced; but, in any case, close research in the same direction must be productive of interesting and valuable results.

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THE DESIGNS FOR THE TIPTON LOCAL BOARD NEW GAS-WORKS.—Messrs. Kirkham and Hersey, of 21, Abingdon Street, Westminster, have just been called in to inspect and report upon the plans submitted, in competition, for the new gas-works about to be erected by the Tipton Local Board; and at the last meeting of the Board the report they made in reference to the designs was adopted. On the accompanying sealed envelopes being opened, it was found that the first premium of £100 fell to Mr. Thomas Proud, of Birmingham; and the second of £50 to Messrs. Bromilow and Cheers, of Cornwall Buildings, Queen Victoria Street, E.C.; while the arrangement of Mr. Edward Pincher, of West Bromwich, was adjudged third by Messrs. Kirkham and Hersey.

MR. ALFRED WILLIAMS AND THE MAKERS OF PLAYING CARDS COMPANY.—Mr. Alfred Williams, as Master of the above-named City Guild, presided at the annual dinner last Tuesday, on which occasion many whose names are well known in the gas profession were present. Among others Mr. John Aird, Mr. J. Bernays (President of the Society of Engineers), Mr. Baldwin Latham, Mr. Jabez Church, Mr. B. F. Davies, Mr. C. Gandon, Mr. C. Horsley, Mr. Alfred Lass. Mr. W. Liddall, Mr. A. Mead, Mr. M. Mildred, Mr. J. Manwaring, Mr. H. Manwaring, Mr. T. Porter, Mr. R. P. Spice, Mr. W. T. Sugg, and Mr. M. Ogle Tarbotton. There was a large muster of City magnates also present; so that the proceedings passed off with great *éclat*.

THE GAS QUESTION AT STRETFORD.—Last Saturday's *Manchester Guardian* says:—"We understand that, at a special meeting on Thursday, the Shareholders of the Stretford Gas Company had under consideration the recent decision of the Salford Hundred Court of Quarter Sessions with reference to the price of gas and the threatened further proceedings on the part of the Consumers Committee to enforce the return of £17,000, or thereabouts, alleged to have been wrongfully appropriated in the shape of profits. It was also reported that certain negotiations had taken place, with a view to a settlement of the consumers claims, between two of the Directors and two gentlemen representing the consumers, who number some 7000. Ultimately it was resolved to grant full powers to the Directors to effect such a settlement with the Consumers Committee as may be possible, with the view to bring the case to an end. It is probable that a settlement will shortly be arrived at."

SALE OF SHARES IN THE SHEFFIELD UNITED GAS COMPANY.—On Tuesday last, 517 "E" shares of £8 10s. each, in the above-named Company, were offered for sale by auction, at Sheffield, by Mr. Bush. They were sold subject to the payment, on Jan. 1, 1881, of £2 per share, this being the amount of the calls which have been made on these shares. There was a large attendance of bidders, and the competition was spirited. The shares were put up in lots of 50, and the first two (100 shares) were purchased at 77s. 6d. per share premium. Then 100 shares were sold at 80s. premium, and 100 at 81s. premium. Another 100 went at 81s. premium, and 50 at 82s. premium. The odd 67 shares were knocked down at 82s. premium.

## Water and Sanitary Notes.

A CONSIDERATION of the particulars given in another column as to the applications to be made to Parliament next session in respect to water supply undertakings will show that, with the exception of the Metropolis, there is scarcely anything of note to come before the Legislature. There are only five notices relating to the incorporation of new Companies, and one of these is for sea water, which is rather outside the subject. There will be the Bill of the South Metropolitan Spring Water Company, which, like the sea water scheme, has appeared before; while of the three other projects, one has reference to the parts about Sutton Bridge (in Lincolnshire), another relates to Beverley, and the third to Dundalk. There is one Bill for the purchase of a Water Company's undertaking—that of the Colne and Marsden Local Board, in Lancashire. Five existing Water Companies intend applying to Parliament for additional powers. Among these there is the East London Company, who require further capital. The Sheffield Water Company solicit an extension of time for the completion of works, as well as power to raise some additional capital. The other Companies are situated at Eastbourne, Fylde, and Matlock. In addition there are eighteen notices of application to the Board of Trade under the Gas and Water Works Facilities Act, 1870. Among the applications for extended powers by municipal authorities, is one from the Cheltenham Corporation, who ask for further time for the compulsory purchase of lands and for the construction of the works authorized by their Act of 1878. The Reading Corporation make application in respect to water-works and the supply of water. At Bingley, compulsory powers are sought for the purchase of certain existing works, as well as entering into agreements for taking water in bulk from neighbouring authorities, and selling water to them. In these days, when so much that is sensational with regard to the water supply is continually being advanced, it is somewhat remarkable that so little is proposed in the shape of new works. A calm consideration of the facts may be supposed to lead to conclusions rather at variance with the exciting exordiums which sometimes agitate the public mind. An increased demand for water is naturally to be expected, seeing the rate at which our towns are increasing in size. This, of itself, will necessitate sundry applications to Parliament as time goes on and circumstances alter, in addition to which the development of scattered communities into small townships will bring about many enterprises on a limited scale. On the whole, we are somewhat surprised that the coming session looks so barren in respect to schemes for extending the water supply.

Lieut.-Col. Bolton having a little bevy of analysts about his ears, begins to find himself rather perplexed. These gentlemen are not always easy to be understood, and at the present moment the difficulty is increased by the fact that they fail to agree in their results. Dr. Bernays finds 23·520 grains of solid matter in a gallon of Kent water, while Dr. Frankland reports 29·624 grains, and Dr. Tidy goes as high as 33·610 grains. But the oddest thing of all is the manner in which Dr. Frankland determines whether the water supplied by the various Metropolitan Water Companies is fit or unfit for dietetic purposes. In his last monthly report, Dr. Frankland states that the water drawn from the Thames was unfit for dietetic use, except in the case of the Chelsea Company; yet he says that the water of the Grand Junction and Southwark Companies was "alone efficiently filtered." Thus the water supplied by the Chelsea Company was not "efficiently "filtered," and yet is not condemned as unfit for dietetic use, whereas the water supplied by the Grand Junction and Southwark Companies, which was efficiently filtered, is declared to be unfit for drinking purposes. The case is the more puzzling seeing that the samples of all the Thames waters were taken on the same day. Neither does the difficulty end here, for while Dr. Frankland declares the water of the Grand Junction and Southwark Companies to be efficiently filtered, Professor Wanklyn and Mr. W. J. Cooper state that the water supplied by these Companies contained more organic matter than any other. The proportion is not high, being at the utmost six parts in a million; but the contradictory conclusions are remarkable. While accomplished scientists are thus scrutinizing the water as it flows through the mains, Lieut.-Col. Bolton is exercised concerning the state of affairs at the point of exit. The constant supply affords a remedy, but its application is delayed by untoward obstructions. Allusion is made to the recalcitrant Vestryman, an owner of a large quantity of small property, who has lately figured before a

Police Magistrate, for refusing to alter the fittings of his houses so that they might receive the benefit of a constant supply. This occurred in the district of the Lambeth Company, and it appears that in a report made by the Company's Waste Inspector, the water, in one of the houses referred to in the summons, was found running to waste, and "pouring out "through the butt, which was so rotten that a hole could be "pushed through by the finger." The condition of this particular butt is stated to be the same as that of many others in the Metropolis, and the fact is cited by Lieut.-Col. Bolton as showing "the necessity of these abominable receptacles "being totally abolished." This gentleman also observes that "as considerable pressure has been put upon the Water "Companies to take the initiative in the introduction of the "constant supply, it would be well if the public were to "render the Companies every assistance, instead of raising "difficulties for them to encounter in changing the system "of supply, amongst which difficulties may be counted the "obstinacy of many of the landlords and tenants in refus-"ing to perform their part of the work." The constant supply is now being introduced by all the Companies except the Grand Junction.

During the recent Local Government Board inquiry, conducted by Mr. Thornhill Harrison, relative to an application by the Rochdale Corporation for power to borrow £80,000 on the water-works account, for the completion of the Spring Mill reservoir, some extraordinary evidence was given by Mr. T. Hawksley, the Engineer of the works, showing that this reservoir was really founded on an ancient glacier bed. A plan of the puddle trench was submitted to the Inspector, and Mr. Hawksley declared it to be the most marvellous puddle trench ever constructed. The natural strata formed a perfect jumble, comprising "all sorts of things." In one place there was a lump of rock, in another a layer of shale, in another a piece of clay, and everything tossed about in the utmost disorder. To all appearance, before the trench was dug, the place was perfectly sound; but when the work was fairly commenced these extraordinary difficulties began to present themselves. It was this which was said to account for the cost of the work. It was certainly an unlucky spot to hit upon, and the Inspector seems to have been very much struck with the plan that was submitted to him. No opposition was offered to the application, and the inquiry only lasted a few hours. The expenditure on the Rochdale Water-Works up to the close of October was stated to be £522,000. The whole supply of water is to over 100,000 people; but the entire number who might be supplied is stated to be about 115,000 or 120,000. The daily supply per head is now between thirteen and fourteen gallons, but Mr. Hawksley said it would soon be fifteen gallons.

The Treasurer of the Metropolitan Dairymen's Benevolent Institution is highly indignant that anything should be said or written in disparagement of British milk. In an after-dinner speech last week, this gentleman is said to have referred to "articles which have recently appeared in several "weekly newspapers as to the sale of alleged impure and "dangerous milk." Borrowing inspiration from the "Sage "of Chelsea," he was led to suppose that the readers of the aforesaid journals were "mostly fools." Some of these people had been actually frightened into giving up milk altogether, and many more had preferred drinking "that pasty sort "of stuff called condensed milk." The indignant Treasurer of the Dairymen's Institution went on to argue that the dairymen understood their business very much better than "the "incapable idiots" who wrote on the subject in the journals to which he referred. This strikes us as rather strong language for a milkman's advocate. A licensed victualler inveighing against teetotallers could scarcely be more emphatic. But with regard to this milk question, we would remind the highly-incensed champion of the trade, that the remarks in the weekly as well as the daily press have been founded on statements contained in the last annual report of the Local Government Board, and in the reports of sundry Medical Officers of Health. The Chairman of the meeting at which this extraordinary address was given, more discreetly threw the blame of unwholesomeness on milk imported from abroad. "Foreign cans full of foreign "milk" were thus indicated as the source of the disease attributed in London to the milk supply. This is rather a puzzling explanation, for we should hardly have thought that foreign milk was fresh enough for the London market. But the milk supply always was a puzzling question, and the irascible Treasurer would have us leave the matter in the hands of "the intelligent dairyman," who, he assures us, understands "the preparation of the milk provided for public "use" far better than the idiotic journalists who differ from him. We feel the great delicacy of the subject, for it might perhaps be suggested that the water had something to do with the question. According to the Local Government Board, nearly a million gallons of water go into the milk supply of London in the course of a year. As the constant supply is not yet universal, the process is not altogether without danger. Somehow or other it appears that, on the whole, milk is either a very excellent article of diet, or else a very bad one.

## WATER LEGISLATION FOR 1880.

(*Concluded from p.* 846.)

Only one Act was passed, during the last session of Parliament, authorizing the construction of entirely new works by a Corporation already in possession of powers for the supply of water:—

The *Liverpool Corporation Water-Works Act* is the much-debated authorization of the scheme, so frequently referred to in these columns, for supplying the city with water from the Rivers Vyrnwy, Marchnant, and Afon Cowny, in Montgomeryshire. The Corporation are empowered to construct a reservoir by an embankment across the River Vyrnwy, and to connect the same by an aqueduct with the River Marchnant. This reservoir is to be connected by an aqueduct running through six counties, and provided with several relieving tanks, with a terminus in the parish of Prescot, Lancs. The execution of the necessary works is made subject to saving clauses for the protection of a number of interests. The Corporation are empowered to borrow for the purposes of the Act £3,250,000, to be redeemed in sixty years after the Act shall have been in operation for ten years, with respect to money borrowed within such period of ten years; afterwards all money borrowed to be repaid in sixty years from the time of borrowing. The Corporation have to provide compensation water for the Severn Commission, and to pay the costs incurred by various Corporations in opposing the Bill.

We now have to deal with the Acts giving further powers to local bodies in respect to water supply; the following having reference to Acts passed solely with this object:—

The *Cork Improvement Act* authorizes the Corporation of Cork, among other things, to improve their water-works, and to borrow £30,000 in respect of the same, to be repaid within sixty years. The Corporation take powers to make bye-laws for the better control of the water supply and prevention of waste. There is no specific statement of the works for which the additional capital is required.

The *Doncaster Corporation Water-Works Act* empowers the Corporation to construct additional works and acquire land compulsorily for such purpose. The Corporation take power to construct a certain line of water-mains in the parish of Ravenfield, Yorkshire, to be completed in five years. The powers for the compulsory purchase of lands, conferred by the Act, are not to extend beyond three years. The cost of the proposed works is to be defrayed out of moneys to be raised by the Corporation under their Act of 1873, or their Provisional Order of 1879.

The *Edinburgh and District Water-Works Act* mainly applies to the financial powers of the Edinburgh and District Water Trustees. The Trustees are empowered to borrow a further sum of £150,000 for the purposes of their undertaking, and also in the course of any year to borrow from bankers sufficient money to defray current expenses, provided that all such loans are paid off at the end of the year during which they have been received. Certain provisions as to the supply of water are included in the Act.

The *Rathmines and Rathgar Water Act* enables the Rathmines and Rathgar Improvement Commissioners to improve the water supply of their district. The Commissioners are authorized to construct an impounding reservoir on the River Dodder, and several catchwater drains in connection therewith, and to construct service reservoirs and lines of water-mains, and to fit up and maintain such telegraphs as they may require for the purposes of their works; all to be completed within five years from the passing of the Act. The Commissioners are empowered to acquire any lands necessary for the protection of their water-works against nuisances. The Commissioners are compelled to afford compensation water to the millowners and others interested in the Upper Dodder, under a penalty of £100 per day for default. The said millowners are empowered to convene meetings for the purpose of regulating their proceedings by vote in connection with the provisions of the Act, a millowner to have one vote in respect of every foot of water-head belonging to the mill for which he is entitled to vote. Millowners in meeting are to have power to appoint an engineer and clerk, and all

expenses incurred in carrying out the provisions of the Act by the millowners are to be borne proportionately by the occupiers of the mills on the same basis as their votes are determined. The Commissioners take power to borrow £100,000, to be redeemed within sixty years. Water is to be supplied constantly at high pressure, and the Commissioners may contract for its supply in bulk. Provisions are inserted for the protection of several parties, including the Alliance and Dublin Consumers Gas Company, and directions are given for rating railways and gas-pipes.

The *Sligo Borough Improvement (Revival of Powers) Act*, among other things, revives the powers and extends the period limited for the construction of water-works and the supply of water authorized by the Sligo Borough Improvement Act, 1869. The Corporation are empowered to construct an impounding reservoir and lines of water-mains, and also a service reservoir, to be completed within five years, and to borrow £25,000 for the purposes of the water-works. All the powers and privileges conferred on the Corporation by the Act of 1869 are revived by this Act, with a few unimportant modifications. The Corporation are authorized to levy for their water supply a rate not exceeding 2s. in the pound. A clause is inserted providing for the sale by the Corporation of pipes, &c., outside their district, to any Sanitary Authority in whose district the pipes may lie, and who may desire to purchase such property.

The *Wakefield Corporation Water-Works Act* authorizes the Corporation of Wakefield to construct certain reservoirs, to contract their limits of supply, and to make additional regulations for their undertaking. The Act of 1839 is repealed, several districts included in the Act of 1876 are excluded from the present Act, and the works authorized by the Act of 1876 are to be relinquished, in consequence of a better source of supply having been found. Reservoirs, filter-beds, and conduits are to be established for taking water from the Rishworth Moors, to be completed within ten years from the passing of the Act, and the power to acquire land compulsorily is limited by the Act to a period of five years. The Corporation take powers to borrow £300,000 for the purposes of the Act, to be repaid, after the expiration of ten years, within a period of seventy years from the commencement of the sinking-fund at that time. The Corporation may, out of the water revenue, establish a reserve-fund amounting to £15,000. Compensation water is to be provided to certain claimants, and there are inserted in the Act clauses for the protection of various neighbouring Corporations. The Corporation are empowered to supply water and sanitary fittings to users of their water, and also to supply water in bulk.

Now come certain Corporation Improvement Acts which among other things, make provision in respect to water supply. They are the following:—

The *Huddersfield Improvement Act* applies in part to the water undertaking. The limits of supply are extended to include several townships in the West Riding of Yorkshire. The Corporation are authorized to sell, under certain restrictions, to any outside Sanitary Authority, any of their pipes, &c., lying within the district of such authority. The Corporation are also authorized to test water in wells within their district, and close same if the water is found unfit for use or otherwise insufficient; and for this purpose the provision of section 44 of the Water-Works Clauses Act, 1847, is amended in accordance with the compulsory powers of the Corporation. The Corporation take power to borrow £150,000 for water-works purposes, to be repaid within one hundred years; the sinking-fund for the repayment thereof to be commenced ten years after the time of borrowing.

The *King's Lynn Corporation Act* amends certain portions of the Act of 1859 respecting the Corporation Water-Works. The water is to be supplied constantly under pressure. Water is not to be stored in underground pools or tanks, and provisions are inserted for maintaining the purity of the source of supply. The Corporation are empowered to make bye-laws for the regulation of the water supply, and to supply fittings. Directions for the application of the water revenues are included.

The *Lancaster Corporation Act* applies to the finances of the water undertaking. The Corporation are empowered to borrow for water-works purposes £15,000, to be repaid in sixty-five years by the operation of a sinking-fund, set aside from the revenues and accumulated at compound interest. A reserve-fund to the extent of £12,000 is to be formed out of the water revenue.

The *Oldham Improvement Act* extends the limits of water supply throughout the district added to the borough by the Act, and to the district of Royton. The Corporation take power to construct an embankment across the Medlock, and two settling-pools, as well as additional filter-beds and several lines of main, to be completed within ten years. The Corporation are confirmed in the possession of certain lands and buildings purchased by them. Certain provisions in the Act of 1870 are repealed, and it is enacted that water-rents for domestic purposes shall be at the rate of seven and a half and eight and a half per cent. on the gross annual value of houses within and without the borough respectively. Water may also be supplied in bulk without the borough, and the Corporation are authorized to supply fittings, if required. The sum of £50,000 may be set aside out of the water revenue for the formation of a reserve-fund. The Corporation are empowered to borrow for water purposes the sum of £100,000, and may create debenture stock. Water-works loans are to be extinguished, by a sinking-fund, in seventy years.

The *Stafford Corporation Act* authorizes the Corporation, among other things, to abandon the construction of the works of water supply contemplated by their Act of 1876, a higher and more advantageous site for a reservoir having been obtained. The Corporation are empowered to construct a pumping-station and well on their own land, and a reservoir in connection therewith, the said works to be completed in five years. The limits of supply are extended to include certain localities in Staffordshire. For the water purposes of the Act the Corporation are authorized to borrow £25,000, repayable in sixty years.

The *Wigan Improvement Act* includes provisions for the prevention of waste or misuse of water by issuing regulations as to fittings, &c., and the licensing of fitters and plumbers. The Corporation are also authorized to supply water and sanitary fittings, if required by their customers.

The only Act remaining to be noticed is the following, which does not come into any of the classes into which the other Acts have been grouped:—

The *Lancashire County Justices Act* authorizes the Committee of Visitors of the Lancashire County Lunatic Asylum to construct works and supply water to the Asylum. A reservoir is to be constructed and filled by three lines of pipes from a spring and two streams respectively, and thence a line of main is to supply the Asylum. The works are to be completed in five years. The necessary funds to the extent of £20,000 are to be raised on the security of the county rate. Clauses are inserted for the protection of the Corporation of Manchester as regards the Corporation water supply.

## ELECTRIC LIGHTING LEGISLATION IN 1880.

In order to complete our notices of the Private Legislation of the past sessions, as far as it affects the interests with which the JOURNAL is principally concerned, we need to mention that three Corporations (besides the instances already recorded under "Gas Legislation") obtained power to supply electric lighting by the under-named Acts:—

The *Burton-upon-Trent Corporation Act* empowers the Corporation for a period of five years, and for the purpose of experiment, to light by electricity streets and places of public resort, and for such purpose they may borrow £5000 on the security of the district rate. The Corporation remain liable, however, to indictment for nuisance in respect of their proceedings under this section. The usual protective clauses are inserted.

The *Hull (Corporation) Electric Lighting Act* is entirely concerned with lighting by electricity. During a period of ten years from Sept. 1, 1880, the Corporation may light by electricity streets and places of public resort, at cost price only, and they may borrow for this purpose the sum of £50,000 on the security of the district rate, repayable in ten years. Clauses are inserted for the protection of the Postmaster-General and of the three Gas Companies supplying Hull and the neighbourhood.

The *Preston Improvement Act* enables the Corporation to light streets and public places by electricity during a period of five years, and they are empowered to borrow for such purpose £10,000 on the security of the district rates, repayable in ten years. The Corporation remain liable for nuisance, and have to submit to the usual saving clauses.

AN offer is now before the public such as is not often made—one entire Adventurers share (estimated value £100,000) in the New River Company, which is advertised for sale by tender before the close of the present year. Dividends, directors fees, and bonuses represent, it is stated, an annual value averaging £3040; while, besides conferring the special privileges of a seat at the Board of the Company, and votes for the counties of Middlesex and Hertford, the holding of so large an interest in the Company carries with it a proportionate participation in the reversion of all the freehold land and houses situated in the vicinity of the Company's works at Clerkenwell.

## SIEMENS'S REGENERATIVE GAS-LAMPS.

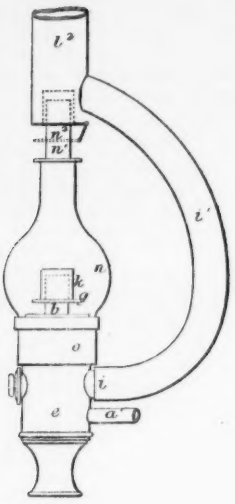

FIG. 1.

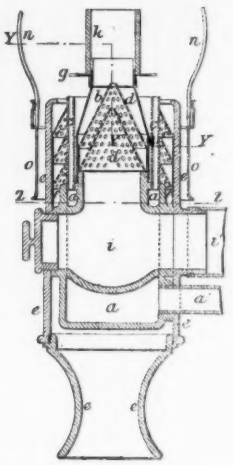

FIG. 2.

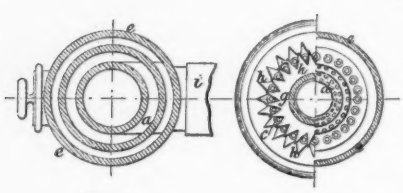

FIG. 3. FIG. 4.

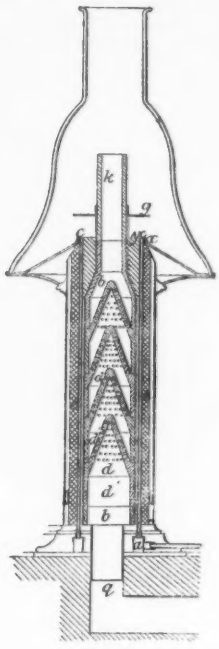

FIG. 5.

In the beginning of the present year (see Vol. XXXV., p. 60) we gave a translation of a lecture by Herr F. Siemens, of Dresden, on the subject of Regenerative Gas Lighting, in which he described some forms of lamps designed by him to utilize the heat of combustion in increasing the illuminating power of gas. Herr Siemens's operations attracted considerable attention, and opinions have since been freely expressed for and against the principle taken up by him in a new shape, after having been tried without much success in other ways many years since. Herr Siemens at least was sufficiently satisfied with the result of his early experiments to endeavour to improve the construction of his lamps, and the accompanying illustrations, taken from the specification of his English patent, No. 1561 of the present year, will serve to show the latest forms in which he has attempted to carry out the regenerative principle in the combustion of gas for lighting purposes.

The action of the lamps may be briefly described as causing the products of the gas-flame to pass downward through a central regenerative chamber within the annular burner (which now replaces the crude arrangement of separate bat's-wing flames), while the air required for combustion passes upward through an annular chamber surrounding the burner. Fig. 1 is an elevation, and fig. 2 an enlarged vertical section of one form of lamp. Figs. 3 and 4 are transverse sections on the enlarged scale through Z, Z, and Y, Y, respectively. Gas is admitted into the chamber, *a* (fig. 2), by the pipe, $a^1$, which may either project from a wall or form part of a pendant, and passes upward to the burner, *c*, consisting of a ring of small tubes. Within the chamber, *a*, is formed a second chamber, *i*, having a lateral opening communicating with the flue tube, $i^1$, and an upper opening concentrically within the burner, *c*, and communicating with the lower end of the regenerative chamber, *b*. This chamber contains one or more perforated metallic cones, *d*, and has its upper end contracted somewhat, as shown, and extended a certain height above the tops of the burner tubes, *c*. Upon such upper portion is fixed the notched shield or deflector, *g*, and above this is fitted a separate cylinder, *k*, by preference of fire-clay, but which may also be of other suitable heat-resisting material. Surrounding the outside of the gas chamber, *a*, is a casing, *e*, extending up to nearly the tops of the burner tubes, *c*, an annular space intervening between the two, into which are introduced one or more perforated conical frustra, *f*, and which constitutes the regenerative chamber for heating the air supply that enters the casing at the open lower end. The upper end of the casing, *e*, is turned over and notched, as shown at *h* (fig. 4), so as to form an outer notched air deflector. The flue tube, $i^1$, may lead to any convenient flue or passage for producing the requisite draught; but by preference it is connected, as shown in fig. 1, to a tube, $i^2$, immediately above the lamp, the action of which will be presently explained. The upper part of the casing, *e*, is surrounded by a gallery, *o*, carrying a lamp glass, *n*, a metal continuation of which, $n^1$, opens into the closed lower end of the tube, $i^2$, a slide or throttle-valve being provided at $n^2$, whereby this communication may be more or less restricted. When the gas is lighted at the burner, *c*, the lamp first burns in the ordinary manner; that is to say, the air for supporting combustion passes up through the regenerator, *f*, and a draught is created which draws the flame upwards in the chimney-glass. After a few seconds the tube, $i^2$, becomes heated, and also heats the tube, $i^1$, by conduction sufficiently to induce an upward current in the latter, and in consequence of the suction thus caused at the upper end of the cylinder, *k*, a portion of the heated products of the flame is made to pass downward through the regenerative chamber, *b*, and the chamber *i*, into the flue tubes, $i^1$ and $i^2$. The throttle-valve at $n^2$ is then closed, whereupon the greater part of the products of combustion is caused to pass downward in the direction already indicated, and impart their heat to the sides and filling of the regenerative chamber, *b*. This heat is radiated and conducted to the chamber, *e*, and the gas tubes, *c*, consequently heating the air and gas passing up through them. The notched deflectors aid the effect by dividing up the air supply into small streams impinging on all sides of the flame, as described in a previous patent. By continuing the air casing, *e*, some distance downward, and making it of heat-conducting material, a draught may be created to enable the chimney-glass to be dispensed with in some cases.

Fig. 5 shows a form of lamp in which the regenerative chamber is made of some height, and constitutes a pedestal for the lamp. In this form the upper end of the chamber may be either open, as in the previous arrangement, and provided with notched shields, or the space outside the burner may be closed at *x*. The filling of the regenerative chamber is in this case formed of perforated cones of fire-clay, *d*, with separate cylindrical pieces, $d^1$, to be easily removeable in case of breakage. The lower end of the chamber, *b*, communicates by an underground flue with a chimney for producing the necessary draught. In a quiescent atmosphere this lamp burns with a steady flame, and does not need any glass; but for open-air use it is preferably enclosed in a bell-shaped glass, with a large opening at the bottom, as shown.

Concerning the performance of these lamps, Herr Hasse, of the Dresden Gas Works, stated at the last meeting of the German Gas and Water Works Managers Association, that he had tested the standard lamp, fig. 5, with the following results:—At the commencement of the trial, presumably shortly after the lamp had been lighted, an illuminating power of 150 sperm candles was obtained with an hourly consumption of 1440 litres of gas. This is equivalent to a photometric value of 2·95 candles per cubic foot, with a consumption of 50·83 cubic feet per hour. The illuminating power gradually increased as the lamp continued burning, until an hour had elapsed, when the heating of the air had reached the highest point, the light then given being equal to 500 candles without increase of the consumption of gas. This is equal to a photometric value of 9·83 candles per cubic foot. Thus it appears, from Herr Hasse's showing, that the regenerative process, when in full operation, increases the illuminating power from 150 to 500 or 3·33 times, rather over half as much as was originally expected by the inventor. Herr Hasse remarks that the long time it takes to arrive at the best conditions of working is a certain disadvantage, though not a serious one. A shorter form of standard lamp is also made by Herr Siemens, at a certain sacrifice of regenerative power, for use on a street pillar, or to stand on a table. The present arrangements of the lamps and their supports are rather cumbrous and inelegant. It remains to be seen whether this can be altered, and as to which Herr Hasse is sanguine.

There is a striking difference in principle between any other modern form of large burners brought out for competition with the electric light, and these lamps of Herr Siemens. All others depend on the construction of the burners and their disposal in groups. Herr Siemens depends not only on the construction of the burner,

but also on the previous heating of the air required for combustion, which he claims to have brought to as great perfection as in the regenerative system of carbonic oxide furnaces. That the burners themselves are of good design, apart from the regenerative process, is said to be proved by Herr Hasse's experiments. Fitted as an ordinary Argand, one of these burners was tested in comparison with an Argand of the best pattern, and gave the following results:—With a consumption of 230 litres (8·12 cubic feet) per hour, the old pattern Argand consuming 200 litres (7·06 cubic feet) per hour, the illuminating power of the two burners was as 175 is to 100; hence, 230 : 200 : : 1·75 : $x$, or $x = 152$. Therefore, with 230 litres (8·12 cubic feet) of gas per hour, the Siemens burner produces an effect equal to that of 350 litres (12·355 cubic feet) per hour in the Argand. According to this statement it would appear that the consumption of gas in the new burner is as 230 to 350, or as 1 to 1·52, when compared with another giving the same effect; so that the success attending the Siemens system of lighting is in no inconsiderable degree due to the burner itself, although not to the extent to be ascribed to the regenerative principle.

Herr Hasse's statements are satisfactory so far as they go, and we are bound to accept them as strict representations of facts. But they do not go quite to the extent that might be desirable for an inquiry of such vital importance in its bearing on the best conditions under which gas may be consumed for illuminating power. If Herr Siemens is right as to the direction of his researches, nothing short of a revolution in the practice of gas lighting *in excelsis* must be looked for. If Herr Hasse had aspired to be the apostle of the new order of things, he might have added to his declaration several items of information which would have materially helped in establishing his conclusions on an intelligible basis. It was the more incumbent on him to do this as the denial of the utility of pre-heating the air supplied to gas-flames has been placed on record during the present year by the Committee of the British Association for the Advancement of Science, who reported at the Swansea meeting that by heating the air to 520° Fahr. they were only able to obtain an increase of illuminating power from 16 to 17½ candles. Beyond this they did not go, because of the melting of the apparatus employed, and we may suppose that the advantage accruing from the process when carried so far—only 9 per cent. extra illuminating power gained with air at 520° Fahr.—was not sufficiently promising to induce them to continue their research with special appliances. The Committee may have been mistaken in this particular, as it is more than probable that an increase of heat in the air, beyond the limit at which they stopped, might have a greatly increased proportionate effect upon the light evolved, for we know that at high temperatures light increases more than heat. But the possibility of conveniently adapting this known effect of heat to any convenient form of burner is just the point that needs conclusive demonstration, and this is not supplied by Herr Hasse. He does not give the temperature to which the air was raised in the lamp tested by him with such surprising results. The facts upon which the Committee in question based their conclusions are given in detail, and we need at least as much detail in the statements which we are required to accept as refuting theirs. We ask, in short, for convincing evidence that a gas-flame may be immensely intensified—say from three to four times—by being supplied with air no hotter than can be carried to it with safety to the material of which the lamp may be conveniently constructed.

Another consideration strikes one in reading Herr Hasse's communication. The illuminating power of the gas experimented with should have been stated as determined by the ordinary standards. There is nothing to show that it was other than the ordinary 14 or 15 candle gas of most Continental towns, but it is not so expressed. Again, the kind of Argand burner used by Herr Hasse in his separate estimation of the Siemens burner needs further definition. There are Argands *and* Argands, and merely calling the particular sample in question a good one signifies little. These considerations are only mentioned to show how much more conclusive the comparison might have appeared had the factors been stated a little more clearly, without any intention of doubting the value of the information actually given. As a matter of fact, we may find a fair basis for comparison in the statement of the results obtained from the Siemens arrangement when at its best. It there appears that with a consumption of 50·83 cubic feet of gas per hour, a photometric value of 9·83 candles per cubic feet was obtained. According to the experiments of Mr. Hunt, at Birmingham, last spring, a Sugg's 200-candle Argand in a circular lantern, consuming 46·75 cubic feet of gas per hour, gave a value of 3·95 candles per cubic foot. The British Association Committee's experiments with a similar burner, having three concentric rings as well as a centre jet, gave for a consumption of 55 cubic feet of gas per hour a photometric value of 4 candles per cubic foot, the gas employed being of the ordinary 16-candle London quality. It may therefore be assumed that the last-named value—4 candles per cubic foot—is the best result that can be produced in the most powerful Argand burner, with gas of this quality. Assuming, then, that Herr Hasse's experiments were made with gas of equal quality, it follows that the performance of the Siemens burner is to that of the Sugg large Argand as 9·83 to 4, or as 2·457 to 1. Referring to the account of the value of the Siemens burner without regeneration, it is stated that it gave a value of only 2·95 candles per foot under these conditions. This must be considered poor for the large quantity of gas consumed per hour, being little better than the Paris Gas Company's burners, as used in the Rue du Quatre Septembre, and shown by Mr. Hunt to be far inferior to either Sugg's or Bray's burners of anything like equal size. Hence it may be argued, as against Herr Hasse's statement that the Siemens burner, fitted as an ordinary Argand, is so superior to the "best form" of ordinary Argand, that the Siemens burner must improve wonderfully as it diminishes in size, or the "best form" of Argand with which it was compared must have been in reality a very bad form, since it is, by itself, worse than Sugg's large Argand by 4 to 2·95, or as 1·356 to 1. Judging from this, it would appear that if Siemens's regenerative principle could be applied to a Sugg's 200-candle Argand burner, the recorded effect of the former would be increased by over 35 per cent., or from 9·83 to 13·26 candles per cubic foot.

Considerations of this kind show that there is nothing much to be admired in Herr Siemens's burner, however much may be learnt from the ingenious way in which he makes the heat of gas serve for the advantage of the light. The shortcomings of Herr Hasse's tests need making good by another authority before we can join him in praising the new system unreservedly. Still a case has been made out for further investigation, and it may be hoped that this will at once be carried out. The inventor belongs to a family who have always been ready to publish their work for the benefit of the world, and in the present instance there are especial reasons why Herr F. Siemens should be anxious to submit his invention to keen examination by English gas engineers. We are quite willing to admit that he has achieved a success by his last invention, and we now want to know precisely how much he has really effected.

## SOUTH METROPOLITAN GAS-WORKS.

Having shown the manner in which the new concrete gasholder-tank at these works has been constructed, we proceed to describe the particularly light framing designed to support the crown of the holder when empty. This timber framing, as fixed in the gasholder-tank, and of which an illustration is given with the present number of the JOURNAL, consists of round poles, the longer ones being 9 to 10 inches in diameter at the butt; and the others 5 to 6 inches in diameter—the latter supporting the radially-arranged framing of 3-inch deals. Square timber uprights were at first thought of, but on consideration the question arose, "Why pay for squaring the timber and weakening it at the same time? Why not use it in its natural form?" To this question there could be but one answer, and round poles were chosen.

The number of uprights has been greatly reduced by the use of side or raking struts, which spring from the main uprights at about the middle of their height. These struts not only take the place of additional uprights, but they stiffen those from which they spring. The main uprights rest on a small pier of concrete, in which two holding-down bolts are fixed, and to these the bases of the three uprights are secured, thus preventing the possibility of floating.

This framing is very much lighter than that fixed in the last gasholder constructed, on which the uprights were more numerous and of greater substance, consisting entirely of "die square" timber. The radial framing was also much stronger and heavier, being formed with 11 in. by 4 in. timber, whereas in the present case simple deals 9 in. by 3 in. are used, and being cut to the curve of the crown, are reduced at the ends of each deal to 7½ in. by 3 in. There are at four points in the circle a couple of diagonal braces, formed of plain poles, to prevent any lateral motion. At the top of the uprights is a light cast-iron shoe which receives the deals, and to which they are secured.

It was thought when this framing was first laid out on paper, that it would be very light, but now that it is erected it is found to be excessively strong. If it had now to be designed it would be made much lighter, and the radials would not be put so close together. They would be formed of 7 in. by 2½ in. battens, and the number of main uprights would be reduced from 24 sets to 18.

As the benching on which the main uprights rest is not at one uniform level, having been made to follow the line of the fine sand, the small concrete piers also vary in height, in order to make the sets of main uprights uniform in length and position.

## Correspondence.

*[We do not hold ourselves responsible for the opinions expressed by Correspondents.]*

### DR. ADAMS'S GAS STOVE.

SIR,—Through a friend, my attention has been directed to the letter of Mr. Denny Lane, of Cork, which appeared in your JOURNAL for Nov. 23. That letter contains several objectionable passages in point of fact, of opinion, and of inference; and I request your permission to correct some of them.

"The report of Dr. Adams and Mr. J. L. Bruce," says Mr. Lane, "states that 51,300 of these new units of heat were utilized per cubic foot of gas." Mr. Lane is under a delusion, for Mr. Bruce and I have never been associated in a joint report; he has never used my units, and he uses exclusively the standard units. His observations on my stove were read to the Philosophical Society of Glasgow, and published, before I had any knowledge of them. In my own communication, made to the same Society a year afterwards, so far from associating Mr. Bruce with these units, I expressly stated that he did not use them, and that he preferred the standard unit, although he admitted all that I claim—viz., their convenience and their very near approach to accuracy.

Mr. Lane says: "Since 1 lb. of air at 62° contains 13·156 cubic feet, and since the specific heat of air is only 0·237 as compared with that of water, it follows that the standard thermal unit contains (13·156 ÷ 0·237) 55·5 of the new units now proposed." Mr. Lane's data are here altogether erroneous. One pound of air contains only 13·14 cubic feet, and the specific heat of air is 0·2379 according to the generally accepted estimate of Regnault, and if the number of decimals is reduced to three the figures ought to be quoted as 0·238. It follows

that (13·14 ÷ 0·238) the standard thermal unit contains 50·5 of the new units now proposed. This correction makes a very material difference when applied to Mr. Lane's calculations.

Mr. Lane also says: "The new stove, which by Dr. Adams's own statement 'gives 8 to 16 times as much useful effect as any stove hitherto made.'" This alleged quotation is a pure fabrication. I never made the statement, and never held the belief it expresses. Mr. Lane says that in certain conditions of the metallic casings of a stove, "*the air becomes burnt*, as was pointed out by Dr. Arnott half a century ago." Dr. Arnott is not chargeable with such erroneous teaching. Air cannot be burnt, as every chemist knows; although with uninformed persons there exists such a belief. Dr. Arnott's words are, "The air *acquires a burnt* and often sulphurous *smell*, in part, no doubt, *because dust*, which it often carries, *is burned*." Mr. Lane *guesses* the loss of heat in my stove, in the products of combustion passing up the flue, at 20 per cent. Mr. Bruce states, with elaborate precision, the steps by which he demonstrated that this loss was only 7 per cent.; and his conclusion has been frequently verified by other equally competent observers. And there is nothing at all wonderful in this small percentage of lost heat in the chimney. In "Box on Heat," p. 184, it is stated that "nearly the whole of the heat which any fuel is capable of yielding may be utilized by using a long flue-pipe." The interior of my stove is practically a long flue-pipe, folded up, and otherwise of exceptional construction. Mr. Lane shows, by a calculation which includes his erroneous estimate of lost heat, and is based on the erroneous data already corrected, that 1108 of the standard thermal units must be given off by the combustion of 1 cubic foot of gas in order to meet the alleged performance of the stove; that this is a quantity "at variance with all previous experiments;" that "the total *heat of combustion* of coal gas is generally *calculated* to be only about 700 units;" and that "unless there is something exceptional in the gas employed in Glasgow," he is "at a loss to account for the extraordinary results," &c. The last paragraph or period contains the substance of Mr. Lane's argument.

The first point is the value of Mr. Lane's standard of 700 units. The lowest estimate I find, with an exception quoted below, is given (by Box) at 696 units; and is vaguely based on experiments by Peclet on the flame of an oil-lamp, and by Morin on the flame of coal gas. These experiments date far back, and are wanting in precision or authoritative value. The next estimate I can find is that of Mr. Vernon Harcourt, who gives the units at 756; calculated from the analysis of a gas of low specific gravity, ·420. From the data in Kinnear Clark's "Manual of Tables," &c., I calculate 870 units, and Favre and Silberman calculate 840 units. These refer to ordinary gas of low specific gravity—say ·400 or thereabouts. If cannel gas, such as is used in Scotland, were calculated, there would be found higher results; for, as a general rule, the heavier the gas the greater the illuminating power—and there is fair reason to infer that the heating force has a similar analogy. The specific gravity of our Scotch cannel gas is given by Mr. G. R. Hislop, of Paisley, as ranging from ·516 to ·716. But I cannot anywhere find a quantitative analysis of any of our Scotch gases, and therefore no material for calculating their heating force. Even if I had such analysis, it would still be but a small help in solving the question of the results that are to be obtained from a right application of the heating force. Of that more hereafter. Meanwhile, of actual demonstration on this head of the question, the record is a blank, with one partial exception. Dr. Wallace, of this city, in a paper read to the Glasgow Philosophical Society, in December, 1879, said: "As regards heating power, we have no definite information;" and, as an opening contribution to this altogether neglected subject, he gives the results of experiments made by himself on three qualities of gas of specific gravities ·574, ·525, and ·442 respectively. The experiments consisted in raising one gallon of water from 60° to 160° Fahr., and measuring the gas consumed. There were utilized 522, 455, and 347 units of heat; and Dr. Wallace calculated that he had realized "about 55 per cent. of the theoretical heating power." From this we may calculate that these three samples contained theoretically 949, 827·2, and 630·9 units per cubic foot. So much for the assumed standard of 700 units per cubic foot on which we have so little information, *even when limited to theoretical calculations*. We are still farther off when we come to the actual results of the application of coal gas for heating purposes. But all available information shows that, by improved methods of utilizing gas, we are making a progress the ultimate extent of which cannot be conjectured from the mere estimate or calculations of theoretical heat units.

Mr. Hood, in his standard work on "Warming and Ventilation," describes a gas stove burning 12 to 15 cubic feet per hour; and, from his data, it is shown that 1 cubic foot of gas will heat 23,813 cubic feet of air 1° Fahr. "This, then," says Mr. Hood, "will be the total effect of a stove of this kind." At a later date Dr. Parkes, in his standard work on "Practical Hygiene," says that 1 cubic foot of gas is capable of warming 31,290 cubic feet of air 1° Fahr., which shows a decided advance in the method employed in utilizing the units of heat, or potential energy stored in the gas. But Mr. Hood, in the latest edition of his work (1879, p. 312), says, "Since the early editions of this work were written, an improved method of burning gas has been introduced . . . and by this means the expenditure of gas is reduced one-half when the same effect is produced." In other words, he says there is now obtained, by an improved method of burning gas, no less than 47,627·2 cubic feet of air raised 1° Fahr. by 1 cubic foot of gas. And this enormous advance by no means satisfies Mr. Hood's confident anticipations of still greater results from still further improvements. To his remarks on this point, I will afterwards return; but, meanwhile, it will have been noted that we have approached very near the sum of the new units, to the amount of which Mr. Lane so seriously objects. But that sum has been already overpassed. In the latest edition of "Ure's Dictionary of Chemistry," Vol. II., p. 550, it is recorded that 1 cubic foot of gas heated an apartment containing 2500 cubic feet of air from a temperature of 60° to 80·8° Fahr. This 2500, multiplied by 20·8, gives 52,000 of the new units, or 700 above the number to which Mr. Lane takes exception.

I have here recorded four stages of progress made in the utilization of gas to the purpose of warming air, and I will present them in tabular form, which more readily catches the eye and dwells in the memory. I will also, from Mr. Lane's formula corrected, give the equivalent number of standard units of heat utilized per cubic foot of gas.

*First Stage of Progress*. .—1 cubic foot of gas heated 23,813·0 cubic feet of air to 1° Fahr. = 471·5 standard units of heat utilized.
*Second Stage of Progress*.—1 cubic foot of gas heated 31,290·0 cubic feet of air to 1° Fahr. = 619·6 standard units of heat utilized.
*Third Stage of Progress*. .—1 cubic foot of gas heated 47,827·2 cubic feet of air to 1° Fahr. = 943·1 standard units of heat utilized.
*Fourth Stage of Progress* .—1 cubic foot of gas heated 52,000·0 cubic feet of air to 1° Fahr. = 1029·7 standard units of heat utilized.

The above table is suggestive, and the imagination can picture Mr. Lane at any one of the stages of progress refusing to give credit to any farther advance on the ground of previous experiments, sneering at the authors of the wonderful new discovery, denouncing them as having made statements which were certainly exaggerated, invoking the sympathies of the makers of the older apparatus by suggesting that they were being held up as very much in the dark, &c., &c.

We need not travel far out of the road for abundant illustrations which are strictly in analogy, and which should teach caution to hasty sceptics. The weight and the properties of a pound of coal are the same at this day as in the days of Watt, Rumford, and Black, who carefully investigated its properties and determined its heating force or units of heat, so far as their knowledge and the appliances at their command enabled them. They came so nearly to a common result that for long it was the accepted rule that 1 lb. of coal would raise the temperature of 39 lbs. of water from 32° to 212° Fahr., and this was the limit. But such was the progress of improvement in apparatus for the combustion of coal, that, in 1838, Mr. Parkes gave, in the "Transactions of the Institution of Civil Engineers," detailed results of the every-day working of a "Cornish engine" which heated 85 lbs. of water per pound of coal from 32° to 212° Fahr.; thus demonstrating an amount of heating force in coal altogether unsuspected, and considerably more than double that of "all previous experiments." But even this extraordinary development of heating force in coal fuel is put in the shade by the statement of Captain Galton, Director of Works and Public Buildings, and a recognized authority on questions of heating. Captain Galton, in a paper read by him to the Society of Arts in 1873, stated that 1 lb. of coal should raise from 50 to 60 gallons (about 600 lbs.) of water from 45° to 212° Fahr.

Illustration might be heaped upon illustration to show the fallacy of confounding the potential energy, or store of power which may be present in matter—of confounding this with the force or effective action which that matter is capable of developing under varying conditions, and this is done by Mr. Lane when he speaks of "the total heat of combustion of coal gas," as if it were synonymous with what is a mere conventional phrase. If the unit can be effectually utilized, you may then have the total heat—not otherwise. So many grains of gunpowder when ignited within the barrel of the old Brown Bess musket will throw a leaden bullet to little more than 100 yards to any effective purpose, but will project the same bullet with deadly effect to 1500 yards if ignited within the tube of a Whitworth or Martini-Henry rifle. The *power* or potentiality in the gunpowder remains unchanged, but the projectile force is modified, and the ultimate intended *effect* is changed, by the co-operating or resisting action of the gun-barrel.

Light and heat are identical forces, and coal gas possesses the elements or power which develop both. But coal gas is not light and is not heat. One sample of coal gas develops more light than another sample, if tested under the same conditions; and the difference between the two, when measured, is called by the gas analyst so many numbers of "candle power." Why not say "units of light"? In strict analogy they are convertible terms; or, if not, I should like to have it pointed out to me wherein consists any essential difference. The candle power—will it be permitted in me to say units of light?—in different manufactures of coal gas varies extremely. What are these extremes? In a list before me, wherein the illuminating power or potential unit of light is indicated by the conventional phrase "candle power," I note that 80 range from 11 to 14 candles; 180, from 15 to 20 candles; and 160, from 21 to 33 candles. This range has still farther extremes of candle power, all contained in, and capable of being developed from coal gas—that heterogeneous and most complex composition of different gases and vapours, which, although reducible to classes and leading components, according to the bias or object of each individual analyst, yet comprises and involves a variety of properties and of forces which have not been determined, and certainly cannot be expressed under any term of speech as synonymous with light itself. Many of your readers are likely to be better versed in this subject than I am, and therefore may not require to be reminded that an addition of a few grains of one or more of the constituents of coal gas—say, naphtha or propylene, effects a change of 20 to 60 per cent. in the light-giving effect. This change cannot be ascribed to the presence of carbon alone, although with many that opinion still holds, but to some peculiar association of the gaseous molecules. But although a certain light-giving potentiality may exist in a given sample of gas, that light can only be utilized or developed through the instrumentality of a gas-burner, of which there are many kinds. And how much the choice of a burner may affect the result has been shown by many observers, and probably by no one better than by Dr. Wallace, in the report presented in his own name, and those of Professor Dittmar and Mr. Wills, to the British Association in 1878. Assuming as a thoroughly established fact that whatever the composition of the gas or whatever the source of the illumination, the fact is patent, he says, that a given quantity of gas burned under different conditions yields widely different effects. Ag as which with one burner gives a light equal to only 3¾ candles, gives with a change of burner a light equal to 17¾ candles. Another gas gave an illuminating effect ranging from 7 to 36 candles by burning the gas from a series of different burners. Illustrations still more wonderful were shown in Glasgow during the recent Gas Exhibition, and have given an impetus to the extraordinary improvement now visible in our street illuminating apparatus. The smoky yellow "rat-tail" burner, so long the leading, if not the standard burner, has been relegated to the antiquarian repertory, where, in due time, Mr. Lane's ideal standard of 700 units will, I have little doubt, be laid aside as one of those "idols of

the mind" which, according to Bacon, have in all times proved the most formidable barriers to intellectual progress.

There are other portions of Mr. Lane's letter on which I would gladly have commented, but for the unavoidable length to which my communication has already extended. And in rebutting Mr. Lane's unsupported charges of exaggerated statements, I would willingly have given the names of men, eminent in science, who have independently verified the accuracy of those public statements for which myself or Mr. Bruce can be held responsible. But I am debarred from dragging such names into a discussion which Mr. Lane has unnecessarily made personal. I may, however, legitimately refer to men in business, of whose competency and honour there should be no question, and if Mr. Lane applies to either of the gentlemen I name, or to myself, I cannot doubt, and in my own case I will assure him, that he will have free opportunity to repeat the tests on which the statements, alleged by him to be exaggerated, are based. He may thus still further satisfy himself on the point that he, with perfect fairness of suggestion, but with objectionable tone, has mooted regarding the quality of Glasgow gas. The gentlemen are Mr. W. Harvie, of Glasgow; and Messrs. Wright and Co., of Birmingham. Mr. Harvie, who has made all my models, is well known as having for above 30 years been an industrious practical worker in, and improver of light-giving apparatus; and, having succeeded "beyond all previous experiments" in making ship lights that have been publicly demonstrated as excelling all others in colour, brilliancy, and range, he admittedly holds the foremost position in the supply of our leading mercantile fleets and of the Government vessels of this and other countries. The stoves have been tested in Glasgow, sent to London and there tested, and again tested in Glasgow. Messrs. Wright and Co. are at present occupied, with my co-operation, in a series of tests with the double object of a comparison of the heating force of Glasgow gas with that of such low specific gravity as Birmingham gas; and, further, of establishing a ratio between the heating effects of my stoves with that of a given length of hot-water pipe at different temperatures. In communication with any of these gentlemen Mr. Lane will, I feel assured, be instructed and satisfied.

In conclusion, I again refer to that veteran authority Mr. Hood, who is far from being satisfied with the experience he has recorded of an improved method of burning gas, although this doubles the total effect beyond what he had indicated as possible in the early editions of his work. He anticipates further improvement, in a passage of his work so pregnant with instruction, and so expressive of the lines on which I have been working and have referred to in the specification of my patent, that I feel assured your readers will be gratified if the passage is reproduced entire:—

"It may be doubted whether the most economical method of burning gas has yet been practised. The burning of 'atmospheric gas' in the Bunsen burner will probably be further improved, if the true principles of combustion be studied. There can be no true and perfect combustion until the gaseous products attain a temperature of between 800° and 900° Fahr. If this heat, or any considerable portion of it, could be communicated to the atmospheric air before it were mixed with the carburetted hydrogen, there is every reason to suppose greatly increased economy would be the result. The vast economy by the use of the hot blast in the manufacture of iron is a well-known scientific fact; and further that the nearer the temperature of the air can be raised to the point of complete combustion (800° or 900° Fahr.) the greater the economy that results from the operation. There is but little doubt that if the air admitted to the Bunsen burner could be heated to 400° or 500° Fahr. before it entered into combination with the carburetted hydrogen in the Bunsen burner, a greatly increased economy would be the result. It is by no means easy to effect this process of extrinsically heating the air to any considerable extent, as it involves many difficulties of a practical character; but it is probable that any considerable improvement in the combustion of gas may be looked for in this direction, if greater economy is to be obtained than that which results from the present Bunsen burner, and the employment of the atmospheric gas."

And this is, with literal exactness, *one* of the effects at which I have aimed, *and have successfully attained* in my method of burning gas.

62, *Cambridge Street, Glasgow, Nov.* 27, 1880. JAMES ADAMS, M.D.

[We have received a letter from Mr. Denny Lane in answer to that of Mr. Bruce, published last week; but in view of the possibility of Mr. Lane considering a reply to Dr. Adams's communication necessary, we have held over his letter, at all events till next week. It is right, however, to mention to-day that Mr. Lane says his authority for stating that Mr. Bruce reported conjointly with Dr. Adams on the efficiency of the latter's patented stove, was founded on the following statement published by Messrs. John Wright and Co.:—"As a means of comparing the results obtained from this with those obtained from other stoves, we annex particulars of tests made by Dr. Adams and Mr. J. L. Bruce;" and it was from the particulars so annexed that he quoted the figures given in his letter of the 17th ult.—ED. J. G. L.]

## ECONOMY IN CARBONIZATION.

SIR,—I think something more ought to be said about economy in carbonization. Theoretically the question should be put as follows:—The maximum economy in carbonization is obtained when the greatest *value* of gas and bye-products—viz., coke, tar, and ammoniacal liquor—are produced, using the smallest quantity of fuel and labour, and wearing out as little as possible of the carbonizing plant.

We call value, quantity multiplied by quality; and I decidedly answer that the greatest value of gas is produced by short-time stoking, light charges, and high heats. Experience tells us that in the same ovens, with the same heats, we can carbonize very nearly the same quantity of coal with six-hour as with four-hour charges, and produce very nearly the same quantity of gas per ton of coal—about 10,400 feet. The quality of the gas only ranges from 14 candles with the six-hour charges, to 16 candles with the four-hour work. To make the same quality of gas in six hours would require either cannel or a considerable lowering of the temperature, thus reducing the quantity of coal carbonized to about two-thirds. In my opinion the bye-products are not altered in value by short-time stoking. The coke is made lighter, and a little more friable; but this is compensated for by larger volume. Tar does not seem to be worth less, nor is less made; and the same applies to the ammoniacal liquor. There are, however, fewer naphthaline deposit, and less sulphur is in the gas. Thus far high heats, short-time stoking, and light charges are economical.

Economy of fuel has been the result each time I have made my oven larger, or raised the heats. But here the matter is somewhat complex. Brisk firing does not necessarily make the retorts hotter, nor does the consumption of more fuel make the fire always brisker. The heat produced must be made useful, and this very much depends on the system of ovens and retort settings in use, and especially on the form of the furnace, its grate and flues. Everything in this quarter is of moment, but this is not the place to discuss the subject. In a general way I assert that large ovens and high heats are economical; and to support this theory may state that I have now ovens of seven retorts (oval ones, the round being the least economical), producing per day about 62,000 feet of 16-candle gas, at the rate of 10,400 feet per ton of coal, using only common Newcastle coal. The ovens now made do not occupy much more space than the previous ovens, making only 40,000 feet, and they do not require more than one-fourth of the coke made—or less than 19 per cent. in weight of the coal carbonized, when they previously required from 25 to 30 per cent. I do not see that, with regard only to economy of fuel, a much better result has been obtained by the new gas generator systems.

Economy of fuel would undoubtedly be gained to a much greater extent by setting more retorts in the same oven, and I have often asked myself if some enterprising engineer would not some day build ovens of more than the usual seven, eight, or nine retorts. If I were allowed, I would put up an oven of fifteen retorts in four ranges, the lower ones to be worked from the ground level, the upper ones from a moveable platform. I should not then be satisfied with a consumption of more than 15 per cent. of the coke produced.

Economy of stokers labour is gained by every improvement or additional facility in the retort-house. Economy of labour is, or will be some day, economy in wages; but economy in wages is a fact as often as the ovens are made to produce a larger quantity of gas, and again high heats and large ovens are the true economists.

The last item in the theory of economy is the durability of the retort-settings, &c. High heats are, of course, destructive to them. In my experience, with our present heats the retorts are worn out after about 240 days work, when they previously lasted, or were made to last, about double that time. But then we now make more gas at about the same cost as of old; while keeping the settings long in action is not true economy of coal. Besides, we hope that the retort makers, if required, will make retorts of a quality to meet the new requirements.

*Belgium, Dec.* 1, 1880. ECONOMY.

# Parliamentary Intelligence.

## NOTICES GIVEN FOR PRIVATE BILLS (SESSION 1881) RELATING TO THE SUPPLY OF GAS, WATER, ETC.

ABERDEEN CORPORATION.—Further powers to borrow, and other powers in relation to the Corporation Water-Works; power to substitute one water-rate for the existing water-rate and water-rent; provisions in relation to limit of water-rate; further powers to borrow, and other powers in relation to the Corporation Gas-Works; reduction of the standard of the quality of gas; powers to borrow for current expenditure in connection with the gas department; provisions in relation to sinking-funds; further provisions in relation to the collection of the several rates or assessments leviable by the Corporation; power to levy new rates and assessments; powers to purchase lands by compulsion, and also by agreement; incorporation of Acts; amendment of Acts; and other purposes.

ALNWICK GAS.—Dissolution of the Alnwick Joint-Stock Gas Company; incorporation of new Company, with powers to maintain existing gas-works; new site; to purchase lands by agreement, and to erect and maintain gas-works thereon, and to light the parish of Alnwick; abandonment of existing works when new works are complete; alteration of capital; agreements with the Duke of Northumberland; electric light; and other powers.

BARROW-IN-FURNESS CORPORATION.—Further powers as to gas and water supply; electric light; borrowing of money and consolidation or adjustment of loans; rates and charges; amendment and incorporation of Acts.

BEVERLEY WATER.—Incorporation of Company; construction of works; supply of water to the borough of Beverley; compulsory purchase of lands; power to levy rates, rents, and charges; and powers affecting the Urban Sanitary Authority of the said borough, and other local authorities.

BINGLEY WATER AND IMPROVEMENT.—Construction of water-works; taking of streams and waters; compulsory purchase of existing water-works; water limits, and supply within and beyond; agreements for taking water in bulk from neighbouring authorities, and sale of works to them; compulsory purchase of lands; amendment of lighting powers; borrowing of money; amendment and incorporation of Acts.

BIRKENHEAD CORPORATION GAS AND WATER.—Construction of new water-works and gas-works; extension of limits; acquisition of land; provisions as to electric lighting, &c.; charges; amendment of Acts.

BIRKENHEAD CORPORATION IMPROVEMENT.—Provisions as to water and gas and electric lighting; powers as to paving, lighting, sewerage, drainage, and other sanitary conveniences; charges for water and gas and electric lighting; application of profits; power to raise money; amendment and incorporation of Acts.

BRADFORD WATER AND IMPROVEMENT.—Construction and maintenance of reservoirs, conduits, and other new water-works; compensation for rights interfered with; extension of time for completion of water-works already authorized; raising, levying, borrowing, and re-borrowing further moneys, and repayment thereof; more effectual control of works for distribution and supply of gas and water; amendment, repeal, and incorporation of Acts and Charters.

BRAY TOWNSHIP.—Extension of boundaries, &c., of the Bray township; power to supply water; provisions as to supply of water by the Corporation of Dublin; power to purchase gas undertaking of the Alliance and Dublin Consumers Gas Company, situated in the township, and to supply gas; and other purposes.

BRIGHTON AND HOVE GAS.—Purchase by the Brighton and Hove General Gas Company of the Brighton Gaslight and Coke Company by agreement or amalgamation of those Companies by agreement; purchase by agreement of the Aldrington, Hove, and Brighton Gas Company; compulsory purchase of lands; application of moneys; incorporation and amendment of Acts; and other purposes.

CAMBRIDGE GAS.—Extension of works for manufacture and storeage of gas; purchase of additional lands; further money powers; amendment of Act.

CHELTENHAM CORPORATION WATER.—Extension of time for compulsory purchase of lands and for construction of the works authorized by the Cheltenham Corporation Water Act, 1878; extension of limits of supply; levying of rates; breaking up streets; alteration and extension of borrowing powers and of powers as to application of borrowed money; new powers as to investment of moneys, and other money powers; amendment of Acts; and other purposes.

CLEATOR MOOR LOCAL BOARD.—Construction of new or additional water-works, and provision as to existing works; provision as to compensation; levying of new or additional rates, rents, and charges; borrowing of money and application of funds; additional powers for prevention of waste, &c., of water; as to bye-laws, and generally as to improved water supply; adaptation of existing water-works, and conditions affecting same to new system; repeal, incorporation, and amendment of Acts; and other purposes.

COLNE AND MARSDEN LOCAL BOARD.—Purchase and vesting of Colne Water-Works; new water-works; impounding of streams; supply of water to Local Board district and Trawden, and also beyond limits; provisions as to compensation water; compulsory purchase of lands; levying rates; borrowing money; incorporation and amendment of Acts.

DUDLEY GAS.—Additional share and loan capital.

DUNDALK WATER.—Incorporation of Company; construction of works; supply of water to the town of Dundalk, &c.; power to take streams; rates and charges; provisions as to supply of water in bulk to Dundalk Town Commissioners and trading and other companies; power to the said Commissioners to acquire the undertaking of the Company; amendment of Acts.

EASTBOURNE WATER.—Extension of limits of supply; power to construct new works; provisions as to acquisition of lands, collecting and impounding waters, rates, supply of water, dwellings for officers and servants, agreements with sanitary authorities and others; additional capital; other powers; amendment or repeal of Acts.

EAST LONDON WATER COMPANY.—Further capital and borrowing powers; amendment of Acts.

EGREMONT LOCAL BOARD.—Construction of water-works and supply of water to Egremont and adjacent places in the county of Cumberland; diversion of roads; compulsory purchase of lands; contracts with sanitary and other authorities; levying of rates; borrowing of money; repeal and amendment of Acts; and other purposes.

FYLDE WATER.—Purchase, compulsorily or by agreement, of compensation water to be delivered into Grizedale Brook; repeal of provisions in Fylde Water-Works Acts as to compensation water; additional capital; incorporation of Acts; repeal and amendment of Acts.

GOOLE GAS AND WATER.—Incorporation of Company; regulation of capital and powers of Company; power to undertakers of Aire and Calder Navigation and Goole Local Board to subscribe to Company and appoint Directors and proxies to vote on their behalf; sale and transfer of gas undertaking belonging to the Navigation to Company or Local Board; power to Company or Local Board to carry on same; power to undertakers to retain portions of gas undertaking; Company or Local Board to perform contracts, &c.; maintenance and extension of gas-works; manufacture and storeage and supply of gas, &c., and conversion, sale, and supply of residuals; limits of gas supply; price of gas, &c.; construction of water-works by Company or Local Board; purchase of lands, waters, &c., by compulsion and agreement; power to take water; limits of water supply; power to supply water by meter, and to provide meters; provisions for the protection of water, &c.; laying of gas and water mains and pipes, and opening of roads, &c.; rates, rents, and charges; application of revenue accruing to Local Board; acquisition of patent rights, &c.; power to enter into contracts with local and other authorities, bodies, and persons; power to Local Board to purchase gas and water undertaking of Company; power to undertakers and Local Board to apply funds and borrow money; power to Local Board to apply rates; incorporation and amendment of Acts; and other purposes.

HEXHAM GAS.—Dissolution and re-incorporation of the Hexham Gaslight Company, Limited; power to continue gas-works, to supply gas in Hexham, in the county of Northumberland, and adjoining places; to provide electric light; to raise further capital; to levy rates, rents, and charges; and other powers.

HYDE GAS.—Acquisition of lands; extension of works; additional capital; manufacture, sale, and supply of engines, stoves, and fittings; pressure, quality, and illuminating power of gas; patent rights; levying of rates, rents, and charges; repeal, amendment, and incorporation of Acts; and for other purposes.

IRVINE BURGH.—Acquisition and transfer of gas-works and water-works; new gas-works and water-works; supply of gas and water; purchase of rights to compensation water; electric and other light; compulsory purchase of lands; agreements with local authorities and others; rates and assessments; power to borrow money; incorporation and amendment or repeal of Acts; other powers and provisions.

KIRKCALDY AND DYSART WATER.—New works for an additional supply of water from Lothrie Burn; power to take compulsorily and otherwise lands, waters, and streams, and to divert waters and streams; power to supply water to persons, public bodies, and others within or beyond the limits of supply; power to borrow money; rates and assessments, and alterations of existing rates and assessments; repeal or amendment of Acts; incorporation of Acts; provisions as to sinking-funds; and other purposes.

LINCOLN CORPORATION.—Acquisition of the undertaking of the Lincoln Gaslight and Coke Company, and dissolution of Company; extension of limits of supply for gas, electric and other lighting, heating, and motive power; construction of new water-works; further provision relative to the supply of gas and water; compulsory purchase of land; borrowing powers; amendment of Acts.

LONDON WATER SUPPLY.—Constitution of a public Water Authority, representing the consumers of water in the Metropolis and the adjacent districts, with powers to secure an improved supply of water to such consumers at reasonable rates; power to acquire and utilize existing sources of supply, and to investigate and, if deemed expedient, to obtain powers to provide new sources of supply; transfer to such Water Authority of all powers of regulation and control in respect of the existing water supply now vested in any other body or persons; power to purchase by agreement or arbitration the undertakings of the Metropolitan Water-Works Companies, and to supply water to the Metropolis, and to districts beyond the Metropolis now included within the limits of supply of the Companies whose undertakings are acquired; dissolution of Companies; creation and guarantee of stock; power to raise money for purposes of the Water Authority; amendment of Acts.

LOWER THAMES VALLEY MAIN SEWERAGE BOARD.—Payment of costs incurred by the Board in their application to Parliament for a Bill in 1879; amendment of Acts.

MATLOCK WATER.—New reservoir and works; purchase of lands and easements, compulsorily and by agreement; diversion of water; additional capital; alteration of rate of dividend; amendment and repeal of Act.

OBAN BURGH.—Extension of burgh; new water-works; powers with respect to existing water-works; regulation of water supply; power to levy special water-rate, and other assessments, rates, and rents throughout extended burgh; confirmation of agreements for acquisition of water rights; power to take lands and water; alteration of rights; incorporation, application, and amendment of Acts.

PAISLEY BURGH.—Power to the Paisley Water Commissioners to construct and maintain new water-works; to take lands and water; to borrow further money, and to supply further water within their existing limits, and water to local authorities beyond those limits; power to such authorities to contract therefor; confirmation of agreements; compensation water; prevention of waste; extension of powers of the Paisley Burgh Road Trustees; application of rates levied by them; alteration of rights; incorporation, application, and amendment of Acts.

PARTS OF HOLLAND AND SUTTON BRIDGE WATER.—Incorporation of Company; construction of works; supply of water to Braceborough, Wilsthorpe, Greatford, Baston, Langtoft, Barholm, Stowe, West Deeping, Tallington, Uffington, Market Deeping, Deeping St. James, and Deeping St. Nicholas, in the parts of Kesteven, in the county of Lincoln; and Deeping St. Nicholas, Pinchbeck, Spalding, Peakhill, Cowbit, Weston, Moulton, Whaplode, Holbeach, Fleet, Gedney, Sutton St. Nicholas or Lutton, Sutton St. Edmunds, Sutton St. James, and Sutton St. Mary, in the parts of Holland, in the county of Lincoln; compulsory purchase of lands and easements; power to levy rates; agreements with local authorities and others; and other purposes.

READING CORPORATION.—Provisions as to sewerage and drainage, and as to water-works and the supply of water; rates; amendment of Acts; and other matters.

RICHMOND GAS.—Increase and regulation of capital; voting powers; qualification of Directors; half-yearly dividends; manufacture and storeage of gas and residual products; additional lands; railway siding; testing-place; repeal and amendment of provisions of the Company's special Act; incorporation of the Gas-Works Clauses Act Amendment Act, 1871, and other Acts.

RYTON PARISH LOCAL BOARD WATER.—Power to the Local Board to acquire by agreement or compulsion lands, easements, water rights, and other property, and to supply water; and for other purposes.

SALFORD IMPROVEMENT.—Electric lighting; power to Corporation to inspect and regulate the placing of electric and other wires and tubes over streets; extension of borrowing powers; bye-laws; amendment and repeal of Acts.

SEA WATER SUPPLY TO LONDON.—Incorporation of Company; construction of conduits, reservoirs, pumping-station, and other works between Lancing, in Sussex, and London; power to take and supply sea water; compulsory purchase of lands; meters; rates; protection of works, &c., of Company; sale or lease of lands; incorporation of certain provisions of general Acts; agreements with, and money powers to sanitary and other authorities and bodies; amendment of Acts.

SEVENOAKS GAS.—Extension of gas-works; additional capital; supply of engines, stoves, fittings, &c.; amendment of Acts; and other purposes.

SHEFFIELD WATER.—Extension of time for completion of works; additional capital; amendment of Acts.

SOUTH METROPOLITAN GAS.—Increase of capital; new works; compulsory purchase of lands; extinguishing rights of way; stopping up Ordnance Road; diversion of Marsh Lane; additional lands; supply of gas in bulk; residual products; amalgamation with other gas companies incorporation and amendment of Acts, &c.

SOUTH METROPOLITAN SPRING WATER.—Incorporation of Company; powers to supply water to the Metropolis south of the Thames, and to certain parishes and places in Surrey, Kent, and Middlesex; construction of works; diversion and appropriation of waters; special provisions as to supply of water by Company; agreements with Surrey and Hampshire Canal Corporation, Limited, the Lambeth, the Southwark and Vauxhall, and the West Surrey Water Companies, and other companies, bodies, and persons, and powers to them to apply and raise moneys; provisions as to transfer of undertaking of Company to any trust or public body established for supplying the Metropolis with water; other powers; amendment or repeal of Acts.

STALYBRIDGE EXTENSION AND IMPROVEMENT.—Lighting powers; electric light; borrowing of money; consolidation of mortgages and rates; special water-rate; incorporation of Acts.

STIRLING WATER.—Additional reservoir and works, and supply of water; amendment of Acts; and other purposes.

THANET GAS.—Definition and extension of limits of supply; provisions as to supply of gas for special purposes, and as to purchase, sale, use, and hire of engines, stoves, pipes, apparatus, and appliances, and of patents and patent rights; supply of gas in bulk, as well without as within the existing and extended limits; breaking up of streets, roads, &c.; purchase of lands by agreement; increase of capital; incorporation and amendment of Acts; and other purposes.

WESTBURY-UPON-TRYM GAS.—Dissolution and re-incorporation of Westbury-upon-Trym Gas Company, Limited; power to erect and maintain works for the manufacture and conversion of gas, &c., and residual products, and to supply gas, &c., within rural part of parish of Westbury-upon-Trym; exclusion of district from that of the Bristol United Gaslight Company; power to purchase lands compulsorily and by agreement; to break up roads, &c.; to hold partial rights, &c.; to deal in coal, coke, &c., and to supply meters and fittings; agreements with public bodies, companies, &c.; rates, rents, and charges; sale or lease of lands; amendment of Acts.

WESTBURY-UPON-TRYM GAS.—Incorporation of Company; construction of gas-works, &c.; purchase, &c., of lands; manufacture of gas and residual products; power to supply gas to parish of Henbury and part of the parish of Westbury-upon-Trym, in the county of Gloucester, and in bulk beyond those limits; power to hold, &c., patent rights; agreements with sanitary and other authorities, &c.; gas-rates, &c.; power to supply gas-meters, &c.; sale or lease of lands; amendment of Acts.

WESTGATE AND BIRCHINGTON GAS.—Incorporation of Company; powers to supply gas to parishes and places of Birchington, Westgate, Acol, St. John the Baptist, and Minster, in the Isle of Thanet; provisions as to acquisition of existing gas-works at Birchington; powers to maintain existing gas-works and construct new works for the manufacture and storeage of gas and residual products; powers to manufacture and provide stoves, engines, cooking, heating, and other machinery, and appliances, and to acquire patent rights; agreements with authorities and persons; other powers; amendment or repeal of Acts.

WOKING GAS AND WATER.—Incorporation of Company for supplying gas and water to Woking and adjacent places, and to supply water to Merrow, West Clandon, and East Clandon, all in the county of Surrey; to use patent rights, purchase land by compulsion, and erect works; powers as to supply of gas and gas-fittings, engines, stoves, and other appliances for lighting, warming, ventilating, cooking, and other purposes; capital and borrowing; to lay mains and pipes, &c.; tolls, rates, and duties;

agreements with local and other authorities, &c.; power to future local and other authorities to purchase the whole or any part of the undertaking, and borrow money; incorporation, repeal, and amendment of Acts; and other purposes.

WOKING WATER AND GAS.—Incorporation of Company for supplying water and gas to Woking and adjacent places; construction of works; purchase of lands by compulsion; use of patent rights; tolls, rates, and duties; agreements with public bodies; power to local authorities to purchase the whole or part of the undertaking, and borrow money; incorporation of Acts; and other purposes.

## NOTICES OF APPLICATIONS TO THE BOARD OF TRADE (SESSION 1881) UNDER THE GAS AND WATER WORKS FACILITIES ACT, 1870.

ASHFORD (KENT) WATER.—Extension of limits of water supply; increase of capital; and other purposes.

BRENTFORD GAS.—Increase of capital; regulation of dividends; boundary of district; new works; manufacture and storeage of gas; manufacture and storeage of the residual products of the Company and other companies; supply of gas in bulk; gas-fittings and apparatus; additional lands; incorporation and amendment of Acts.

CHICHESTER GAS.—Additional capital; amendment or repeal, and incorporation of Acts.

DYSERTH, MELIDEN, AND PRESTATYN WATER.—Power to construct, maintain, and continue water-works, and works connected therewith, in, and to supply water to the township of Uwch-lan and the townships, extra-parochial places, or parishes of Cwm, Trecastle, Dyserth (with Ocher-y-Foel), Rhydd, Meliden, and Prestatyn, in the county of Flint, or some of them; to levy rates; and for other purposes.

ELY GAS.—Maintenance of existing gas-works; manufacture and storeage of gas and residual products; supply of gas, fittings, and apparatus; limits of supply; levying of rates and charges; opening of streets; regulation of capital and dividends; additional lands; incorporation of Acts.

GRAYS THURROCK GAS.—Power to maintain and continue existing gas-works and construct new works; to supply gas and gas apparatus; to define limits of supply; power to break up streets; to acquire additional land; agreements with local authorities.

HARWICH WATER.—Power to maintain, continue, and enlarge water-works, and to construct additional works, and supply water to the borough of Harwich, and the parishes of St. Nicholas, Dovercourt, and Ramsey, in the county of Essex.

HENLEY-ON-THAMES WATER.—Powers to construct water-works and to supply water to and within the several parishes of Henley-on-Thames and Rotherfield Greys, both in the county of Oxford, and of Remenham, in the county of Berks.

HIGH WYCOMBE GAS.—Extension of limits of supply; enlargement of works; laying mains and pipes, and breaking up streets and roads; levying rates and charges; additional capital; regulations with respect to price and dividends; incorporation of Acts; and other purposes.

ILFORD GAS.—Additional capital and other purposes.

KIRKHAM GAS.—Powers to maintain, continue, and enlarge works, and to construct and maintain additional works for the manufacture and storeage of gas and residual products in the township of Kirkham, in the county of Lancaster; limits of district of supply; power to acquire and hold lands, break up streets, and to levy rates and charges; incorporation of Acts; and other purposes.

MAIDSTONE WATER.—Construction of new works and taking new springs; taking lands and buildings and other property by agreement; raising additional capital; and other purposes.

NEWHAVEN AND SEAFORD WATER.—Water-works; supply to Newhaven, Seaford, and neighbourhood, in the county of Sussex; levying of water rates.

NEWPORT AND PILLGWENLLY WATER.—Additional capital.

NORTHFLEET AND GREENHITHE GAS.—Amalgamation of the Northfleet and Greenhithe gas undertakings; repeal of the Greenhithe and Northfleet Provisional Orders; uniform regulations and terms over the united district.

PINNER GAS.—Powers to maintain, &c., existing gas-works; to manufacture, store, and supply gas and residual products; limits of supply; levying of rates and charges; regulation of capital, &c.

POOLE WATER.—Increase of capital.

STAINES AND EGHAM GAS.—Additional capital; additional works; new mains; manufacture and storeage of gas and residual products upon additional lands; and other purposes.

STONE GAS.—Power to maintain and continue existing gas-works in the parish of Stone, in the county of Stafford; purchase of lands by agreement; limits of district of supply; power to break up streets and levy rates and charges; agreements with local authorities; additional capital; incorporation of Acts; and other purposes.

WALTHAM ABBEY AND CHESHUNT GAS.—Increase of capital; new works; manufacture and storeage of gas and residual products; additional lands; gas in bulk; gas-fittings, asphaltum, &c.; incorporation of Gas-Works Clauses Act Amendment Act, 1871, and other Acts; amendment of special Act.

WOKING AND HORSELL GAS.—Construction of gas-works; manufacture and storeage of gas and residual products; supply of gas, apparatus, and fittings; levying of rates and charges; opening of streets; regulation of capital; additional lands; incorporation of Acts.

## NOTICES OF APPLICATIONS TO THE LOCAL GOVERNMENT BOARD (SESSION 1881) UNDER THE PUBLIC HEALTH ACT, 1875.

BOLTON CORPORATION GAS.—Power to purchase and hold lands; to construct and maintain gas-works; to levy rates and charges; to borrow money; incorporation and amendment of Acts.

BRIDGNORTH GAS.—Purchase of undertaking of the Bridgnorth Gas Company; maintenance and construction of works for the manufacture of gas and the manufacture of residual products; raising of capital.

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LIGHTING OF GARSTANG WITH GAS.—About two years ago a Company was registered with a capital of £2000, in £5 shares, for the purpose of supplying gas and products to certain places in Lancashire, among which was Garstang, an ancient market town about 11 miles south of Lancaster. The Company have now completed their works, and in the course of the last week of November the lighting of the town by means of gas was successfully accomplished.

A NATURAL GAS WELL IN CANADA.—The *Scientific American* says that the natural gas well in Maskinonge County, Quebec, is attracting considerable attention. Recently quite a gathering of prominent Canadians assembled at St. Pierre to witness tests of the illuminating power of the gas, and to hear the report of a chemist who had been commissioned to examine the well. He reported the gas to be protocarburet of hydrogen, easily and cheaply convertible into the best illuminating gas. The capacity of the well is considerable—35,000 to 40,000 cubic feet a day.

# Legal Intelligence.

## HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

TUESDAY, NOV. 30.

(*Before Justices* FIELD *and* MANISTY.)

METROPOLITAN BOARD OF WORKS *v.* LONDON GASLIGHT COMPANY.

Mr. PHILBRICK, Q.C., and Mr. BIRON appeared for the plaintiffs; the SOLICITOR-GENERAL and Mr. J. C. MATHEW for the defendants.

Mr. PHILBRICK said this was an action, brought upon a special case, to recover payment of a certain yearly rent or annual payment of £150 from the London Gaslight Company with respect to the passage of certain mains from their works, situated on the Surrey side of the river, over Waterloo Bridge to the Middlesex side of London. The obligation originally created was by a deed of licence, dated April 1, 1842, and the question for the Court would be whether the Metropolitan Board of Works, having purchased the undertaking of the Waterloo Bridge Company, had succeeded to the right which that Company had to the payment of this sum. The deed referred to granted to the Board of the Gas Company, for and during the term of 63 years from March 25, 1842, full and free licence, permission, and liberty to lay down pipes and mains for the conveyance and supply of gas over and along Waterloo Bridge and its approaches, for a rental of £150 a year, the payment to be made at the office of the Bridge Company for the time being. The Gas Company laid down two mains over the bridge, and continued to use them up to the month of December, 1870, when they were no longer required, and although they remained under the roadway of the bridge, no gas was transmitted through them. The annual rent of £150 was duly paid to the Bridge Company up to the half year ending Michaelmas, 1878. In 1877 the Toll Bridges Act was passed, and under its provisions the Metropolitan Board of Works were within two years bound to acquire the bridges mentioned in the Act, and accordingly they acquired and purchased Waterloo Bridge with its approaches. The question in the present case would turn upon two sections in the Act of Parliament, the first being the 15th, which stated that "when the receipt for the amount of consideration to be paid for the purchase of the undertaking of any company has been signed in manner directed by this Act, then such undertaking shall, by virtue thereof and of this Act, be transferred and vested in the Board, and they shall be entitled to immediate possession, and they shall have absolute control of such undertaking, freed and discharged from all loans, contracts, debts, charges, and liabilities whatsoever of the company effecting the same, and thereupon all duties, obligations, and liabilities of the company in respect of the same shall, save as by this Act expressly provided, absolutely cease and determine." With this section must be read the 31st section, which expressly provided that "nothing in this Act shall prejudice, alter, or affect any right, privilege, or power vested in, or enjoyed or exercisable by the London Gaslight Company in respect to its mains." The word "undertaking," as contained in the 15th section, was defined by the 2nd section to mean "the bridge of such company, and the approach roads and toll-houses on or near the same, and all lands and works necessarily occupied or used for purposes of the same, and all the estate, right, title, and interest of such company in or to the same, and all rights, powers, authorities, and privileges of such company in relation thereto, under any special Act, or otherwise." Therefore, upon the completion of the purchase, and the signing of the receipt for the £475,000 that was paid for Waterloo Bridge, the Metropolitan Board of Works acquired the "bridge" of the company, the "approach roads," all the "lands and works necessarily occupied," and all the "estate, right, title, and interest of such company in or to the same, and all rights, powers, authorities, and privileges of such company in relation thereto;" the purpose for which the Board acquired the same being that the bridges should be thrown open, for the use of the public, free of toll. The effect of the transfer was provided for in the 16th section, which stated that after the Board had acquired absolute control of any undertaking, the bridge should be "maintained and repaired" by the Board, so as not to become a county bridge; but the approach roads should be public highways, maintainable and repairable as the other highways of the parish or district in which they were situate. It was therefore quite clear that, under the term "undertaking," the rights of the Bridge Company to receive this annual payment from the Gas Company were transferred to the Board; and, especially seeing that the rights of the latter Company were expressly preserved by the 31st section of the Act, it would be very strong indeed to say that while, on the one hand, that which should be the subject of compensation was preserved to them, on the other hand they should be relieved from the obligation on which their right was dependent. Under these circumstances, he submitted that the obligation was transferred from the Waterloo Bridge Company to the Metropolitan Board of Works.

The SOLICITOR-GENERAL, on behalf of the defendants, said, inasmuch as the obligation arose from the contract or licence between the Waterloo Bridge Company and the defendants, it was for the plaintiffs to show that in some way or other the right to receive this sum of money had passed to them. If it had become vested in the Metropolitan Board of Works, it must have been by virtue of some statute; and the question was whether there was anything in the statute quoted which transferred to the Board the right to receive the money which was payable, under the licence, to the Bridge Company. It would not be contended that, in terms, there was any such vesting; there was no clause which made the Metropolitan Board successors of the Bridge Company. Mr. Philbrick's contention was that sections 15 and 31 of the Toll Bridges Act should be read together. The actual state of things was this: Supposing that the 31st section had been omitted from the Act, the defendants would have had a right, under the general law, when this bridge and the approaches thereto became a public bridge and public streets, to lay their mains thereunder; for under the Gas-Works Clauses Act the defendants had a right to break open any public street or bridge for this purpose. So long as Waterloo Bridge was a mere private undertaking, they could only do this by arrangement, but as soon as it became a public street the law gave them a right to lay down their mains. Possibly the 31st section was put in for greater protection; but if it had not been there the Gas Company would still have had the right, without making any payment at all therefor, to lay their mains both under the approaches to the bridge, which were now vested in the neighbouring parishes, but which were part of the consideration for the original payment, and also under the bridge itself. The approaches, as he had said, had become public highways, repairable by the parish, and therefore were public highways within the meaning of the Gas-Works Clauses Act, under which, without payment, the Company could lay down their mains. If the defendants wished to open the roads to repair their pipes and mains, the Metropolitan Board could not give them such right, so far as the approach roads were concerned, and this was a reason why one could understand that the Legislature did not transfer to the Board the right to receive this money, inasmuch as the public Act clearly showed that it was regarded as being for the public good that under all public highways the gas company supplying the particular district should be entitled to put down, take up, and repair their mains. Therefore, when the Legislature put an end to this private undertaking, and placed the highway over

Waterloo Bridge and the approaches to the bridge in the same position as any other highway, it was then intended that the Gas Company supplying the district should be entitled to use that highway just in the same manner as any other.

Justice FIELD: But you say that for greater caution they put section 31 into the Act?

The SOLICITOR-GENERAL said possibly it was a clause that was in a previous Bill of a different character, which was opposed by the Gas Company, and in which such a clause was inserted, and when the public Bill afterwards came to be framed in the form in which it was, the clause which had been prepared for a different purpose was put in the Bill. By the licence from the Bridge Company to the Gas Company, it was provided that the sum in question was to be paid at the office of the Bridge Company. By the Toll Bridges Act the Bridge Company was dissolved, ceased to exist, and had no office at all, so that the place of payment was destroyed. On these grounds he submitted that the liability could not exist unless there was some clear act of legislation which had transferred to the Metropolitan Board the right to receive payment of the amount formerly received by the Bridge Company.

Justice FIELD said the question asked in this case was whether the plaintiffs, the Metropolitan Board of Works, were entitled to recover from the defendants the yearly rent of £150, and in his judgment they were not so entitled. It appeared that the Waterloo Bridge Company had granted to the London Gaslight Company the right to lay down their mains and pipes from one side of the bridge to the other, so that the Gas Company might supply gas on both sides of the river continuously by means of such pipes, the contract giving the Company power to lay their pipes "over and along Waterloo Bridge, and upon, over, and along all or any of the roads belonging to the said Company of Proprietors of Waterloo Bridge," and the Gas Company covenanted, in consideration of this licence, to pay a gross sum of £150 a year to the Waterloo Bridge Company at their office. The £150 was not separated into so much for the bridge and so much for the approaches, and if the £150 was payable at all it was payable in its entirety, and could not be apportioned between the bridge and the approaches, if there was any distinction between the two. The public having determined to take possession of this private property, the control of the bridge was relegated to the Metropolitan Board of Works, they being the persons to whom the Legislature thought it right to commit the care of important structures like bridges, whilst the approaches were left to the parishes in which they might be situate. The whole spirit of the Toll Bridges Act was in the character of a public Act, not as dealing between two private contractors, but in the sense of a great public benefit to be derived from throwing the bridges open to the public. After the Act was passed the Gas Company for some time kept their mains on the bridge, but afterwards, when they found they did not require them, removed them. They had paid rent up to a certain day, and then declined to pay any more. It also appeared that the £150 a year which was payable by virtue of this covenant was a matter for which the Waterloo Bridge Company were entitled to have compensation. The Act provided that "due regard shall be had to the annual value of the tolls payable and revenue arising in respect of the undertaking," and therefore it might be fairly contended that the Legislature meant to give to the Bridge Company full compensation for everything taken away from them. Whether the contract was to be transferred to the Metropolitan Board was another question. If this had been the intent, they might expect to find some such provision in the Act; but there was not a single word specifically referring to such a transfer. If the Legislature had it in their contemplation to transfer this particular contract to the Board of Works, he confessed he should have expected to have found apt words to that effect. It could not be that they were omitted *per incuriam*, because in sections 17 and 18 the Act did provide for other existing matters of the same sort and kind as the contract. It was, of course, necessary that the contract should be transferred. It having been made with the Waterloo Bridge Company, they alone were able to sue; and therefore, unless it could be shown that, by virtue of the Act of Parliament, the right to sue upon this particular contract had been transferred to the Metropolitan Board of Works, the plaintiffs could not claim, and could not have the judgment of the Court. The plaintiffs endeavoured to satisfy this onus by saying first of all, upon the construction of the 15th section, when the receipt was paid for the consideration of the purchase of the undertaking, such undertaking should, by virtue thereof, be transferred to and be vested in the Metropolitan Board. They then said that the "undertaking" included "the bridge of the company and the approaches thereto, the toll-houses on or near the same, and all lands and works necessarily occupied or used for the purposes of the same, and all the estate, right, title, and interest of such company in or to the same, and all rights, powers, authorities, and privileges of such company in relation thereto, under their special Act and otherwise." He was very much inclined to think that the words were not apt enough to describe this particular contract; but assuming for a moment that the word "undertaking" was intended in this sense, what was to happen? The "undertaking" was to be "transferred to and vested in the Board," and they were to be entitled to possession. The subsequent language of the clause certainly tended to cut down the generality of these words, and to show the meaning in which they were used, because then they were to have the "absolute control of such undertaking freed and discharged from all loans, contracts, debts, charges, and liabilities whatsoever of the company, and all duties, obligations, and liabilities of the company in respect of the same shall, save as by this Act expressly provided, absolutely cease and determine." This clearly was an obligation of the company, and it was to cease unless provided for by the Act. Mr. Philbrick admitted that this would be so but for the 31st section. That section was clearly introduced for the advantage of the London Gaslight Company, who might waive the conditions introduced for their benefit. They had ceased to occupy, and had ceased, therefore, to have any desire for the condition imposed, and therefore, as it seemed to him, the section did not apply. The general policy and language of the Act was very strong against the contention of the plaintiffs, and upon all grounds he was of opinion that they were not entitled to recover.

Justice MANISTY concurred.

Judgment was therefore entered for the defendants.

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BRITON FERRY LOCAL BOARD GAS SUPPLY.—At the meeting of the Briton Ferry Local Board last Thursday—Mr. G. H. Davey in the chair—the Rev. D. Lewis proposed that the price of gas be reduced 1s. per 1000 feet. In support of his motion he stated that the reduction would benefit the consumers directly, for with gas of the present quality at 4s. per 1000 feet they would be supplied with a cheaper and better light than they could procure from any vegetable or mineral oil; while the ratepayers would benefit indirectly, for as they were themselves the owners of the gas-works, by a larger number of them becoming consumers they would increase the profits, and thus reduce the rates. After some discussion, it was resolved to reduce the price 6d. per 1000 feet, thus making the price 4s. 6d., 4s., and 3s. 6d. per 1000 cubic feet. The average illuminating power of the gas is 17·30 candles.

# Miscellaneous News.

## MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Forty-fourth Quarterly Meeting of this Institution was held on Saturday, Nov. 27, at the Mitre Hotel, Manchester. Mr. W. CARR (Halifax), the President, occupied the chair, and there was a good attendance of members.

The minutes of the last meeting were, in the absence of the Honorary Secretary (Mr. R. Hunter, of Stalybridge), read by Mr. D. CLARKE (Ashton-under-Lyne), and confirmed.

Mr. Christopher West, Manager of the Ramsbottom Gas Company's works, was elected a member of the Institution.

### ELECTION OF PRESIDENT.

The next business was the election of President for the year commencing in February, 1881.

The PRESIDENT said they would all remember that at the annual meeting in February last they arranged for a new office in connection with the Institution—that of Vice-President. Prior to that meeting they had not had a Vice-President, and the President for the time being, assisted by the Committee, had to carry on the various matters connected with the Institution. The Committee, however, thought it desirable, on several grounds, to have a Vice-President, one reason being that if the holder of the office proved himself suitable, it would be a nice introduction to the presidency. He believed that the gentleman whom they then appointed Vice-President would make an excellent President, and he had very great pleasure in moving that Mr. Chew, of Blackpool, the Vice-President of the Institution, be elected President for the year commencing in February next. The appointment was made at this meeting in order that the President-elect might have an opportunity of preparing his address, or of doing anything that he might desire to do in view of the annual meeting over which he would have to preside. He (Mr. Carr) need not say anything as to Mr. Chew's fitness for the office to which he had proposed him. Most of the members knew him as well as he (the President) did, and some of them knew him better. His conduct as a member of the Institution had been such as to entitle him to their greatest respect and confidence, and—if he was elected, as no doubt he would be—to their warmest support in the position of President.

Mr. COLES (Todmorden) said he had great pleasure in seconding the proposal. Mr. Chew had distinguished himself in connection with the electric light and other subjects. They read Mr. Chew's papers and thought about them, and, no doubt, his address as President would afford much instruction.

Mr. NEWBIGGING (Manchester) said he could not allow the motion to pass without saying a word in support of the candidature of Mr. Chew, who, he believed, would make a very worthy successor to the presidency. He had, perhaps, known Mr. Chew more years than any one present—it was 18 years since he made his acquaintance at his gas-works at Blackpool—and he could say, from his personal knowledge, that Mr. Chew had displayed great ability, as a gas engineer and manager in the way in which he had carried out improvements at his works; while they, as members of the Institution knew that he was well able to express himself in clear, nervous English. He had much pleasure in supporting the motion.

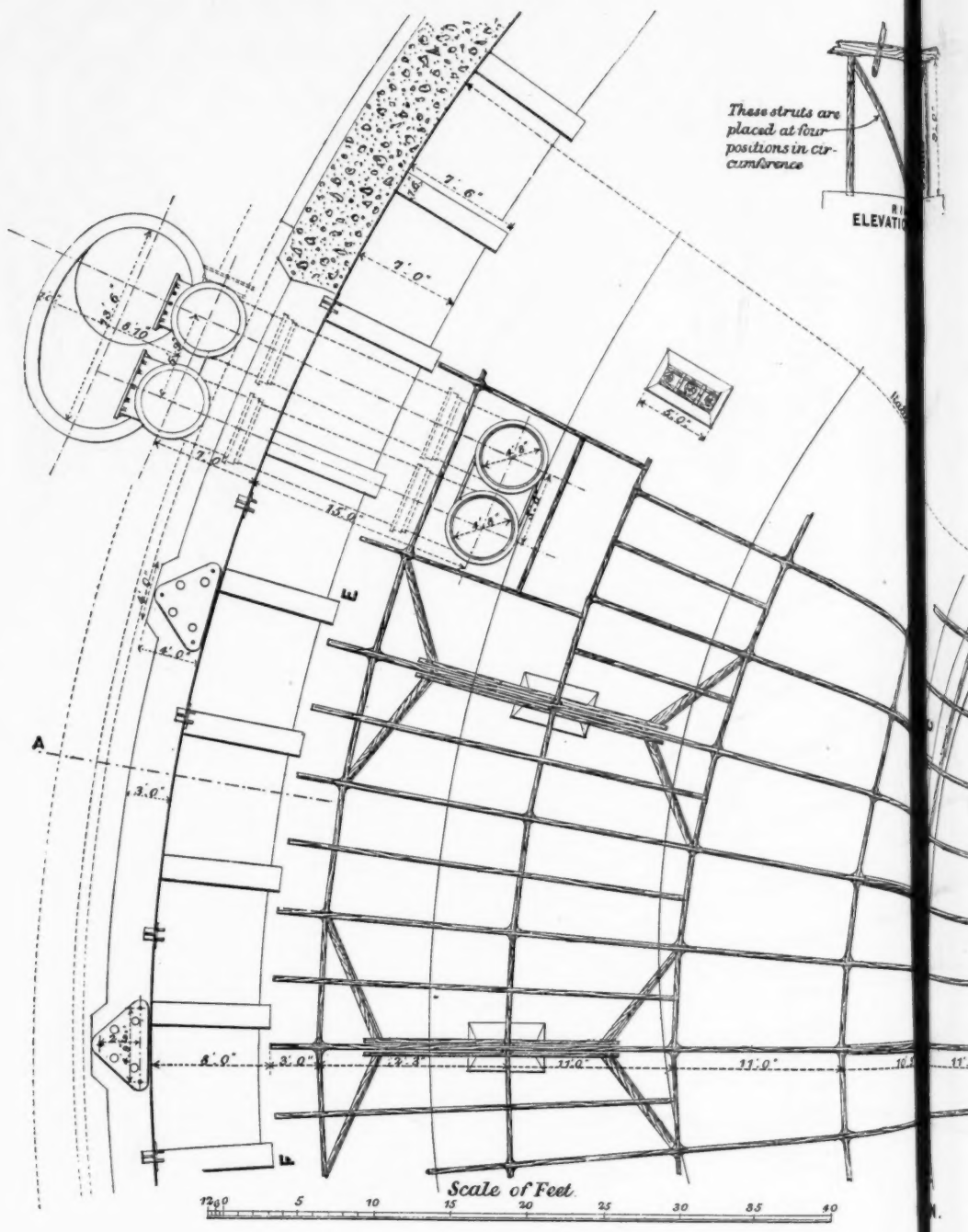
The proposition was then put to the meeting, and carried with applause.

Mr. CHEW said he could only cordially thank the members for the honour they had conferred upon him, and whatever might be the result of his presidency in the coming year, he trusted he should do his best in promoting the spread of information in connection with gas manufacture; but he could only do this if he had the assistance of all the members of the Institution. He felt sure there were gentlemen present who were better fitted for the position than he was, and who would, in due course, grace the office which Mr. Carr at present filled so well.

### PRESIDENT'S ADDRESS.

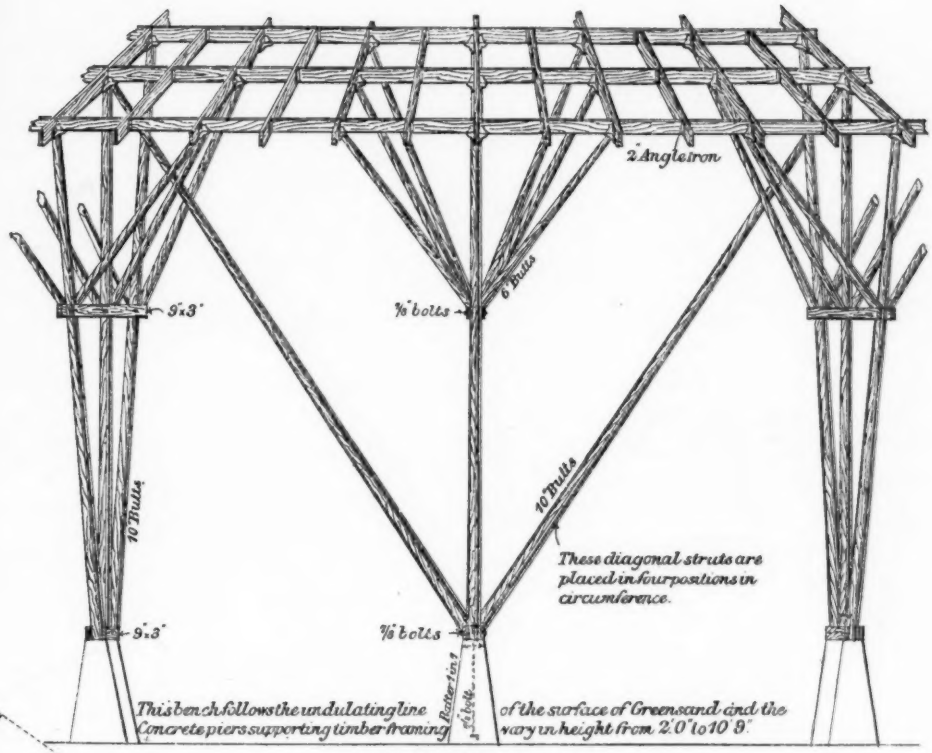
The PRESIDENT (Mr. Carr) said he had not prepared any studied address, but would take the opportunity of making a few remarks, as this was probably the last meeting of the Institution he would be presiding over. He would have the opportunity of introducing his successor at the next meeting, and after that should have to leave the management, so far as the presidency was concerned, to Mr. Chew and those gentlemen to whom he had so gracefully alluded, who were to succeed to the presidency in after years. The office of President was a very honourable one, and one to which he did not succeed without great misgivings; but at the same time he took it as an honour conferred upon himself, and he was pleased that the Committee should think him worthy of it, and also that their action should be endorsed by the great body of the members. It was always pleasing to any man to see that what little ability he possessed was recognized by those of his own profession and those who knew something of his capabilities. He said on the occasion of his election that whatever efforts he put forth would be futile if not seconded by the members generally; and he was pleased to think he had had the support of the great body of the members. The meetings of the past year had been well attended, and there had not been any difficulty in getting subject matter for discussions.

He should like to say a word or two, although it might be going over old ground, about the benefit of Institutions such as this. The members were not banded together for trade purposes, and were not likely to do anything which would bring them into discredit; the aims they had at heart were simply those which were calculated to lift them up generally, and to improve them in the science—if he might call that a science which was intimately connected with several sciences—or, at any rate, to improve the business with which they were connected. There were several reasons why they should keep themselves together in an Association of this sort. They were so scattered about the country as to be only single individuals, swallowed up in the mass of population whose interests, or, at least, whose direct interests, were not the same as theirs; and it was well for them to meet together in the way they did. They had been passing through a period which had been rather trying to gas managers generally. Considerable terror had been struck into the hearts of owners of gas property by the fear that gas lighting was going to be superseded by another form of light. He did not know why there should be the fear which had prevailed, but he supposed that where people's pecuniary interests were concerned some such feeling was natural. So far as he personally was concerned, he would say that if any other light was better than gas, the sooner it came the better it would be for the community generally; and though they, as gas engineers, might suffer temporarily, he did not know that, so long as they had their hands and their heads, they had anything to fear. Still there had been the difficulty, for people outside understood gas lighting so little, and they understood the other system of lighting even less; and when there was no knowledge it was not difficult to get up a panic. Gas engineers had had this panic to contend with for some few years, but they had been able to meet together, and reassure each other that nothing need be feared so long as they managed their business well. They had been able to encourage each other from time to time, and in this way alone he thought the Associations had done great good. There were some of them who had had greater op-

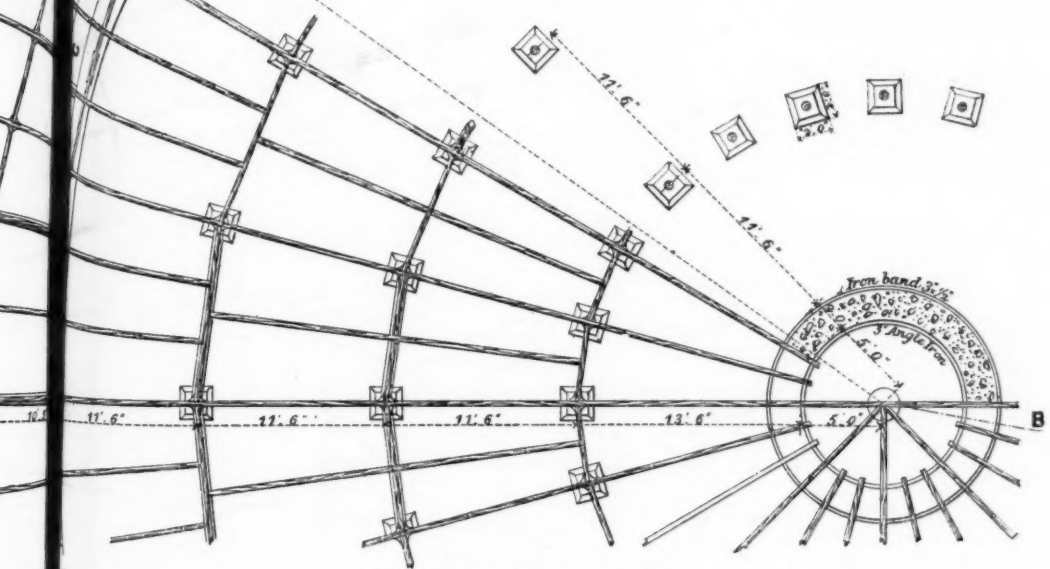



FRAMING FOR CROWN OF GASHOLDER—FIXED IN

GAS[illegible]NY—OLD KENT ROAD WORKS.


2 Angle iron
9"x3"
⅝ bolts
8 Bolts
10 Bolts
10 Bolts
These diagonal struts are placed in four positions in circumference.
9"x3"
⅝ bolts
This bench follows the undulating line of the surface of Greensand and the Concrete piers supporting timber framing vary in height from 2'0" to 10'9".

ELEVATION AT E-F.




*Note. All top timbers are 9"x3".*

GEORGE LIVESEY, M.Inst.C.E., Engineer.

IN[illegible]RETE TANK, 218 FT. DIAMETER BY 55 FT. 6 IN. DEEP.

portunities than others of testing the electric light, and to these they had been able to look for some information as to what was to be done by the light which was to effect such a revolution in the world of lighting. All this had now passed away. The electric light had been, and he had almost said it had gone; but, at all events, it had almost gone back to that quiet position from which it emerged three years ago. It was not more applicable now to ordinary lighting than it was then, and although they all admitted that there was for the electric light a sphere of usefulness which it would be able to occupy, it did not seem at all likely to enter into general competition with gas.

They were now looking forward to a time of good trade. After the gloom and depression of the past few years, they had reason to hope that the country was entering on an era of good trade, and he thought this was likely to cause them, as gas managers, some little trouble. The demands which would be made upon gas undertakings as trade improved would be such as to cause the managers some trouble in meeting them. He did not know whether any of those present had felt the difficulty, but he knew that a difficulty had been experienced in many instances in getting anything like extensions carried out, owing to the fact that the proprietors, or those who had to find the means of carrying out the extensions, were afraid of spending the money. The extensions which had been delayed would come upon them at a time when they were least prepared to make them, and it might be advantageous for them to come together in these times to see how matters of this sort were being met by others; to help each other out of difficulties, and to prevent anything like calamity ensuing from what he believed would shortly come—a great increase in the demand for gas.

In the past nine months the Institution had had three—and with the one which they were then holding, four meetings under his presidency, and at those meetings a number of papers had been read. At the first meeting they had one by Mr. Hawkins, on purification, which brought forth considerable information that was novel to most of the members, and might have proved useful to some. He could not say that he had availed himself of it to any great extent, though he had tried one or two experiments suggested by it. He had, however, heard of some gas managers who had found the information which they gleaned from the paper and the discussion, very valuable to them. They had at the same meeting a paper by Mr. Chew, son of the President-elect, on the subject of the electric light. This paper was pretty well reported, not only in the Manchester papers but in *The Times*, and a short abstract of the proceedings of their meeting on that occasion was published throughout the length and breadth of the country. This, he thought, showed that in meeting together as an Institution, they occupied a considerably higher position than they otherwise could do, and that the public generally took some interest in their proceedings. Following upon that meeting they had the May gathering at Greenfield. They had had such sage advice from their excellent Past-President (Mr. Newbigging), from time to time, on the value of tempering with their work a little rational enjoyment and sensible pleasure, that it was hardly necessary for him (the President) to allude to this meeting, except with reference to the special treat which they had in viewing the water-works then in course of construction at Greenfield. To himself it was a special pleasure to see these large engineering works, similar in extent to those which gas engineers were sometimes called upon to carry out, going on, as well as to visit the beautiful district in which they were situated. The August meeting of the Institution was held at Halifax, and they met at the Corporation Gas-Works. To himself it was a special treat to have the members there, and the effect of the report of the meeting was of such a character as to considerably improve their standing as a body. There were many members of the Halifax Corporation Gas Committee who seriously regretted they had not been present, and blamed him because they had not been properly invited, or they said they would have taken part in the gathering. He belived that in going from town to town in this way the Institution would be leaving a benefical effect behind them, while they might also learn much that would be of value to themselves. At that meeting they had three papers read. Mr. Collins, of Bolton, contributed one on the impurities in coal gas, which, although it did not meet with the enthusiasm with which papers were usually received, was to his mind a very sensible paper. The second paper was by Mr. Eastwood, on coal seams and their stratification. He did not know whether any of the members who were not present at the meeting when this paper was read had read it over themselves since its publication, but he would venture any way to make the statement that the paper was the most valuable one which they had had, or which had been given of recent years in connection with gas institutions in this country. He considered Mr. Eastwood's paper a novel and most valuable contribution, and if they had only had this paper he thought they might rest very well satisfied with what they had done. Mr. Veevers at the same meeting read a paper on Kirkham, Hulett, and Chandler's "Standard" scrubber; while on the programme of the business for the present occasion they had another paper on a kindred subject. Such contributions were valuable, because they enabled the members to accumulate information, and so to improve themselves in the management of their several undertakings. They were also to have papers at the present meeting on retorts, by Mr. Chadwick, of Oldham, and on the elimination of the light oils from the tar, by Mr. Ball, of Leeds.

In conclusion, he said he was pleased to see so large an attendance of members. Their presence made the success of his presidency a certainty. He was very pleased to have been President over such a successful term, and to be able to refer to such a programme of work done as he had mentioned.

The reading of papers was then proceeded with.

*(To be continued.)*

## EXAMINATIONS IN "GAS MANUFACTURE."

The City and Guilds of London Institute for the Advancement of Technical Education have just issued their programme of the technological examinations to be held by them next year; and we may state, at once, for the benefit of those intending to enter, that all communications with respect to these examinations should be addressed to "The Director and Secretary, City and Guilds of London Institute, Gresham College, London, E.C.," the envelope being endorsed "Technological Examinations."

The examinations will be, as formerly, in three grades; but the order will be reversed, No. 1 being the elementary grade (intended principally for apprentices &c.); No. 2, advanced grade (for journeymen); No. 3, honours grade (for foremen and overlookers). Candidates may, however, enter themselves for any grade they choose; and there is no limit as to age. The examinations for 1881 will be held on the evening of May 25, in the local centres to be appointed, or, failing the fixing of such a place, in London.

Certificates (first and second class) will be awarded to successful candidates in each grade. To obtain the full technological certificate, candidates will be required to have passed the Science and Art Department's examination, in the elementary stage at least, in two of certain science subjects which are named in the syllabus of the several technological subjects, unless they can give evidence showing that they have obtained the necessary preliminary scientific knowledge. The Institute will accept as evidence of the candidate's knowledge of the necessary science subjects:—1. A certificate stating that the candidate has obtained a degree in science at one of the Universities of the United Kingdom; or 2. A certificate—from a Professor at one of the following institutions (the list to be added to from time to time): Any University of the United Kingdom; the City and Guilds of London Institute; the Royal School of Mines; University College, London; King's College, London; Owen's College, Manchester; Yorkshire College of Science, Leeds; University College, Bristol; Mason's College, Birmingham; the Royal College of Science, Ireland—stating that the candidate has attended a course of instruction, under a Professor or Professors at one of these institutions, in the science subjects allied to the technological subject in which the full certificate is claimed, and has passed an examination in such science subjects satisfactory to the Professor. Candidates who pass in technology alone will receive a preliminary certificate, which will be exchanged for a full technological certificate, whenever they produce evidence of having passed in science.

The following prizes will be given in each subject, provided the merits of the candidates justify the Examiners in awarding them:—

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|---|---|
| Honours . . | 1st prize, £5 and a silver medal.<br>2nd prize, £5 and a bronze medal. |
| Advanced . | 1st prize, £3 and a silver medal.<br>2nd prize, £3 and a bronze medal. |
| Elementary | 1st prize, £2 and a silver medal.<br>2nd prize, £2 and a bronze medal. |

The Examiner in the "Gas Manufacture" section will, as last year, be Mr. A. Angus Croll, A.Inst. C.E.; and the list published of questions which will be included in the examination, though it will not necessarily be confined to these subjects, is the same as was given for this year's examinations, and printed at length in the JOURNAL for Sept. 30, 1879, p. 511.

## TAR AND TAR PRODUCTS AT THE RECENT GLASGOW EXHIBITION.

In connection with the recent Glasgow Exhibition of Lighting and Heating Appliances, &c., were several displays of the secondary products of gas manufacture; among others one by Messrs. Burt, Boulton, and Haywood, who prepared for the Committee of Jurors an explanatory statement regarding the specimens exhibited, some notes from which may interest our readers.

*Products from the Distillation of Coal Tar.*—When tar is distilled, usually in an iron vessel or retort, three classes of crude products are obtained from the first operation—(1) the oils lighter than water, coming over at the low temperatures; (2) the oils heavier than water, coming over at more extreme temperatures; and (3) the residuum, or pitch, left in the retort after the distilling operation is finished, which residuum is run out from the still in a viscid stream, and solidifies upon cooling. During the earlier period of the history of gas lighting no adequate market could be found for these products; and the first step was taken when Mackintosh popularized the use of india-rubber for the manufacture of waterproof garments. Wood naphtha had been used for the purpose of dissolving the caoutchouc, but it was found to be too expensive, and it transpired that the light oils or naphthas of coal tar would answer the same purpose when refined. Hence the first step in utilizing coal tar was to boil it down merely for the purpose of removing the lighter portions or naphthas. Later on it was discovered that the heavy oils of coal tar, which were subsequently spoken of under the general term of "creosote," were the best possible preservatives to be applied to timber, both to prevent decay, and to protect it from the attacks of insects and other animal organisms; and it was at this stage, about 33 years ago, that Messrs. Burt, Boulton, and Haywood commenced their operations with these products. The heavy oil is likewise at times used successfully as fuel for steam boilers, the liquid fuel, with a suitable burning apparatus, doing the duty of twice its own weight and bulk of ordinary coal. Having thus found uses both for the light and heavy oils of coal tar, the residuum or pitch was still a waste product of comparatively small value, but the introduction of the manufacture of patent fuel soon removed this difficulty. By taking the small or waste coal from the mine, and grinding it up with about 10 per cent. of coal-tar pitch, and subsequently heating the mass and subjecting it to great pressure, it was found that a solid cake or "briquette" could be formed, as hard as the original lumps of coal; and as the material was cast in moulds, it was capable of economical stowage for transport. A separate and softer quality of pitch is also manufactured and used for tar pavement in the ordinary asphalting process.

*Refined Products from Crude Naphtha.*—When the firm first commenced the manufacture of tar products, the light oils had only two uses, being employed for dissolving india-rubber, whilst the rougher or heavier portions were occasionally turned to account as lamp oils for outdoor purposes. The discovery of the aniline dyes produced a great revolution in this respect. Owing to the researches of Hofmann and other chemists, it was found that the coal-tar naphthas contained in their bulk a substance (called benzole) which could be separated by further distillation and rectification. This compound, when treated with nitric acid, produced nitro-benzole—a yellowish compound, with an odour closely resembling that of oil of bitter almonds, and as such it is used in the manufacture of some kinds of soap. Nitro-benzole being subjected to a further series of processes, was transformed into aniline, toluol, and xylol.

*Separate Group of Products from Coal Tar.*—The discovery of the wonderful disinfecting qualities of carbolic and cresylic acids, and the use of these chemical compounds upon a large and increasing scale for such purposes, as also for the manufacture of another series of colours obtained from phenol, have led to the separation and production of those acids upon a large scale, both from the light and the heavy oils of tar.

*Anthracene Group.*—In separating the heavy oil or creosote, as used for the preservation of timber, that substance is found in many cases to be charged with a series of semi-solid compounds, such as naphthaline, anthracene, chrysene, &c. For many years these compounds (which generally went by the name of "creosote salts") were a great hindrance to the creosoting process, as they solidified in the injection cylinders, choked the pipes, and interfered with the proper impregnation of the timber. In order to obviate this inconvenience, the creosote was heated by steam pipes so as to liquefy these semi-solid substances; but the remedy was only partial, and for many years these so-called salts were cleared out from the creosote tanks and reservoirs, mixed with sawdust, and burned or otherwise disposed of. The substances are now, however, becoming of great value in Turkey-red dyeing and printing on cotton, which is largely done with artificial alizarine obtained from anthracene. Anthracene is separated from the heavy oils by filtering and hydraulic pressure, and after going through various processes of purification it is subjected to the first oxidation process, by which the anthracene becomes transformed into anthraquinone. By subjecting this compound to a further series of processes it is converted into alizarine in a commercial form. In the case shown at the Glasgow Exhibition by Messrs. Burt, Boulton, and Haywood, there were seen some beautiful specimens of

dyeing and printing executed with the alizarine which they are in the habit of supplying to some firms in the neighbourhood of Glasgow.

*Naphthaline.*—The utilization of this semi-solid substance contained in the heavy oils of tar is not yet complete on a large scale. In a refined and compressed state it is, however, used for increasing the illuminating power of gas by the albo-carbon process. Other preparations are in use for manufacturing still another series of coal-tar colours, the specimen called naphthol being the basis of a most interesting series of these dyes.

## RAMSGATE LOCAL BOARD GAS AND WATER SUPPLY.

LOCAL GOVERNMENT BOARD INQUIRY.

The Ramsgate Improvement Commissioners having made application to the Local Government Board for authority to borrow certain sums of money—among others, £20,000 for gas-works purposes, and £6000 on account of the water-works—Mr. ARNOLD TAYLOR, one of the Board's Inspectors, held an inquiry on the subject, on Tuesday, the 23rd ult.

Mr. W. A. HUBBARD (the Clerk to the Commissioners) said, in regard to the £20,000 required for the gas-works, the Inspector would remember, in consequence of several inquiries which had been held, the circumstances in which the Commissioners were placed with respect to the gas supply. In the year 1877 the Commissioners obtained an Act to take over the works; and in January, 1878, they acquired them. At the time they went to Parliament for the necessary powers, they knew little of the absolute requirements of the works. They knew they were valuable, and were advised professionally that they were justified in paying certain sums of money for them; but not possessing the works, they could not tell their requirements. After a year's possession, the Commissioners ascertained that considerable extensions would be required; not that the works were out of order, but that a great extension of them was necessary to carry them on properly. It had been noticed that after a local authority acquired works of this kind a great extension of them generally became necessary, and the Commissioners soon found that if extensions were not made at the works they would be unable to supply the town in a satisfactory manner. The Engineer of the works (Mr. Valon) had all the estimates, and he would explain any matter the Inspector wished. He (Mr. Hubbard) might add that at first the Commissioners raised a capital of £80,000, the amount prescribed by their Act. They afterwards ascertained that another £30,000 would be required for works of extension, in order to meet the requirements as they had estimated them for the next seven or ten years. In December, 1879, they accordingly applied to the Local Government Board for powers to raise this money, and Mr. E. H. Wodehouse inquired into the application, and the whole matter was thoroughly thrashed out before him. In May last they obtained power to borrow under a Provisional Order, and the question then arose as to how they were to get through this and next winter. The Commissioners decided that in order to ensure the necessary supply of gas they must set to work at once, and the needed extensions had been commenced. They now wanted to borrow £20,000, having the power to raise £30,000. Mr. Alfred Lass, the Accountant to the Commissioners, was present, and he would give the Inspector all the figures in regard to the gas undertaking up to the 29th of September of the present year.

Mr. *Alfred Lass* then handed in a statement of accounts of the gas-works. He said that including the £65,000 for the purchase of the works, there was up to Sept. 29 last an expenditure of £86,609; and having only power to borrow £80,000, the Commissioners had overdrawn the account, the money being expended on some works which would be mentioned by the Engineer. He added that nothing had been charged against capital account for renewals, but only the extensions of the works.

Mr. *William A. Valon* also handed in a statement showing how the money was to be expended. He said the Commissioners had expended £86,609, which, with a working capital of £5225 and the money they proposed to borrow, would meet their requirements for the next eight or nine years. To arrive at the probable requirements of the place at that time, they had taken the increase from 1870 to 1879, and estimated at the same rate from 1880 to 1889.

The INSPECTOR: You are really looking to your wants ten years ahead.

Mr. *Valon* replied that this was so, and that during the next ten years they had powers to raise, with the permission of the Local Government Board, £30,000, but they now only asked for £20,000. They proposed to spend £4089 for a retort-house and coal store (his estimate for them having been £4500); £226 17s. 5d. for floor plates; £1569 10s. for some of Mr. West's stoking machinery, the Gas Committee having decided to adopt that system; £434 9s. 4d. balance for girders and condenser-pipes; £564 12s. for coal-lifting machinery; £760 for a scrubber; besides an estimate of £2500 for new retort benches and fittings. This gave a total of £101,961 3s. 6d., as against the capital raised and expended—viz., £80,000, leaving a balance of £21,961 3s. 6d.

In reply to the Inspector, Mr. *Valon* said the Commissioners had reduced the price of gas from 3s. 9d. to 3s. 6d. per 1000 feet, and then allowed a further rebate of 4d., which made the price of gas 3s. 2d. per 1000 feet, and at the same time 4d. of the price went to the general district rate, as provided by the Act, thus really making the price to the consumers only 2s. 10d. per 1000 feet. The Commissioners hoped to do better when the works were fully completed.

The application for the water-works loan was then taken into consideration.

Mr. *Lass* handed up another statement of accounts with regard to the water undertaking. The amount of capital expended, including the purchase of the works, up to Sept. 29 this year, he said, was £88,252, the capital already raised being £90,000.

Mr. *Valon* explained that the Commissioners had recently increased their supply of water by tunnelling and making additional adits at Newlands, this being rendered necessary by their affording constant supply in certain parts of the town. They had a good supply at their new works, and, in fact, they could not yet form any idea of their resources, as the pumps had not lowered it to any appreciable degree. To go on with the constant supply, it was necessary to have a new water tower, which would cost £2628 11s. 7d., in order to supply the upper part of the town. The tank for the tower would cost £2256 17s., and would hold 250,000 gallons, thus ensuring a good water supply to all parts of the district. They proposed to have two services—a high and a low level. They would require new mains to the tower and along some of the roads of the high-level service, and these, with the cost of the labour employed and the valves, services, &c., would be £2500. In addition to these, there was a balance of £600 due for pumping mains. All these proposed improvements brought the total expenditure to £96,238, as against the £90,000 borrowed. They therefore asked for leave to borrow an additional £6000, which would be sufficient, the water-rates being paid in advance.

In reply to the Inspector, Mr. *Valon* said they already had a constant supply at the lower parts of the town, but they could not get it to the higher parts until the work now contemplated was completed. They had not raised the price of water, and to the Board of Trade and the Railway Companies they had lowered the price. The Commissioners might have to increase the charge for water when the constant supply was put on. If they went to Minster, they could compel the people there to take their supply.

Mr. HUBBARD said they applied to borrow the money for 80 years.

The INSPECTOR: That time is understood by the Act.

Mr. *Valon* said the Commissioners were not obliged to put money into a sinking-fund yet, but they had already done so. He further stated that the Commissioners did not contemplete any other large expenditure for a good many years to come.

The inquiry then closed, the INSPECTOR remarking he should report in due course to the Local Government Board, who would advise the Commissioners.

Mr. Taylor afterwards went to the gas-works to view the new buildings now in course of construction. He expressed himself highly pleased with them, the general arrangements for the carbonization of the coals, and the machinery in connection therewith, meeting with his entire approval. In the after part of the day he visited the water tower at Southwood. The building itself he much admired, both on account of its strength and structural appearance. The design of the high-level tank and the main supplying it were fully explained by Mr. Valon, and with them the Inspector also seemed much pleased, incidentally making the remark that he was always glad to see public works well designed and carried out efficiently, and in all the works he had that day visited the Commissioners had evidently been well advised.

## THE GAS APPARATUS EXHIBITION AT BLACKBURN.

PRESENTATIONS TO MESSRS. OGDEN AND THOMPSON.

The Exhibition of Gas Apparatus inaugurated by the Corporation Gas Committee of Blackburn was brought to an end on Wednesday, the 24th ult., after a fortnight's run, during which time upwards of 9000 persons were admitted. On the Saturday before the closing of the show no less than 1700 people visited the building, and much interest was manifested throughout, especially in the Cooking Lectures delivered by Mrs. Thwaites, of the Liverpool School of Cookery. A pleasing feature of the concluding ceremony was the presentation, by the exhibitors, of two handsome timepieces to Mr. S. R. Ogden, the Engineer and Manager of the gas-works, and to Mr. W. Thompson, the Secretary of the gas department, in recognition of the services they had rendered in making the exhibition a success.

This project was started by two of the local exhibitors, and sufficient money was soon collected to carry out the object in view. The exhibition closed at 9.30 p.m., and immediately afterwards an adjournment was made to the Council Chamber by the exhibitors or their representatives, and Mr. Ogden and Mr. Thompson, unaware of what was to take place, were called in.

Mr. CUNLIFFE, who was called upon to preside, stated that it gave the exhibitors great pleasure to recognize in the way they intended doing the services rendered to them by both Mr. Ogden and Mr. Thompson. It fell to his lot to present to both the handsome marble timepieces they saw before them. These presents were the spontaneous gifts of the exhibitors, who were wishful to show their high appreciation of the kindness and courtesy of both Mr. Ogden and Mr. Thompson. He hoped that each present would serve as a small memento of the exhibition.

Mr. OGDEN, in responding, said it was with extreme pleasure that he thanked them for their kindness in presenting him with so beautiful a timepiece. He could only say that from his youth up it had always been his ambition to use civility, and he had done his utmost to make the exhibition a success, and it seemed he had taken the right course. He had done his best, and if it had met with approval he was amply repaid.

Mr. THOMPSON, in acknowledging the gift made to him, said he thanked them sincerely for their kindness in presenting him with so handsome a token of their appreciation of his efforts to make the exhibition a success, not only to the Corporation, but to the exhibitors; and he would always regard the timepiece as a pleasing reminder of the exhibition. He thought the apathy of the public at first was caused by the idea some people had with regard to gas-making and gas appliances. They did not seem to understand that a gas apparatus exhibition could be made interesting, and on entering the room the public seemed surprised at the general effect. The various exhibits were examined with much attention, and he hoped exhibitors would have no cause of regret, but might find an increased business as a reward for their efforts to spread a knowledge of cooking by gas.

Remarks of a complimentary character were then made by a number of exhibitors; after which a vote of thanks was accorded to the Chairman, and an adjournment was made to one of the ante-rooms, where an excellent supper had been provided.

The after proceedings were presided over by Mr. Ogden, and Mr. Thompson occupied the vice-chair. The usual loyal and patriotic and other toasts were given, and a most enjoyable evening was spent.

THE GAS SUPPLY OF BARNSLEY.—At the meeting of the Barnsley Town Council on the 30th ult.—the Mayor (Alderman Marshall) in the chair—the gas question again came under consideration, and the resolutions passed at the meeting held on the 26th of October (see *ante*, p. 738) on the question of the charge for gas and the purchase of the gas-works, were considered. A deputation, consisting of three members of the Council, was appointed to wait on the Directors of the Gas Company on the subject. It had been previously agreed that no new lamps should be put up pending the settlement of this question.

SALFORD CORPORATION GAS SUPPLY.—The General Gas Committee of the Salford Town Council have just prepared their report on the operations of the Gas Department during the year ended March 25 last. They state that, in the twelve months, the quantity of gas used and sold was 628,665,300 cubic feet, an increase of 2·11 per cent. on the previous year. The average illuminating power was equal to 20 standard sperm candles. The rental from private consumers for gas was £96,966 11s. 8d.; meter-rents, £2726 12s. 6d.; public lamps, £10,222 10s. 2d.—total, £109,915 14s. 4d.; corresponding period, £113,451 10s. 4d.; decrease, caused by reduced price, £3535 16s. An additional 13,237 yards of new mains had been laid, also 12,494 yards of new mains in place of others of less dimensions. The gross profit was £43,563 8s. 4d., compared with £44,573 4s. 8d. in the preceding year; and it was appropriated as follows:—To interest on mortgage debt, deposits, &c., £12,857 3s. 7d.; sinking-fund, £7892 13s. 5d.; annuity to the Salford district, £2530; depreciation-fund general account, £10,283 11s. 4d. The remainder constituted the divisible profits, and amounted to the sum of £10,000, which has been apportioned proportionately with the consumption of gas in each district:—To the Salford district, £5604 19s. 1d.; to the Pendleton district, £2369 8s. 2d.; to the Broughton district, £2025 12s. 9d. The satisfactory condition of the department enabled the Committee, for the fourth time within four years, to recommend a further reduction in the price of gas, bringing the minimum price down to 3s. per 1000 cubic feet within the borough, and the lowest at which gas is sold in the district. An extension of [illegible] price the in progress, a considerable quantity of new main-pipe [illegible] the works is various parts of the district, and new offices, workshops, &c., are being laid in of erection at Lamb Lane.

## LAMBETH WATER-WORKS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Tuesday, at the Company's Offices, Brixton Hill, when the Directors presented their report on the operations of the Company for the six months ended the 30th of September. In it they stated that during the half year 1816 houses and other supplies of water, estimated to yield an annual rental of £4608 13s., were connected with the Company's works. The capital account showed an expenditure in the six months of £29,460 3s. 10d. The total capital expended by the Company since the Metropolis Water Act was passed, in 1871, has been £487,256 10s. 7d. The greater part of this sum has been expended in laying mains, &c., throughout a large extent of the district not yet built over, and in works for improving the quality of the water, increasing the facilities of distribution, and affording constant supply. The Company's bond debt is £84,055. A call has been made, payable on the 1st of January next, at the rate of £10 per share, on certain of the whole, half, and quarter shares, and will produce £21,892 10s. When the current bond debt is paid off, and the uncalled share capital issued under the Act 32 Vict., cap. 4, is paid up, a further issue of shares to the extent of £92,000 can be made, in accordance with the Companies Clauses Act, 1845. The revenue account showed an augmentation in the water-rents of £5817 18s. 5d. over the corresponding half of the previous year, due to the steady and continued increase in the number of houses built in the district. Compared with the same period, the total increase in the expenditure is £4948 14s. 8d. The expenses which the Government Purchase Bill in the first session, and the Select Committee in the second session of Parliament during the present year, obliged the Company to incur, amounted to £976 11s. 10d., and the costs of the opposition to the scheme of the Lower Thames Valley Main Sewerage Board for the establishment of a sewage farm at Molesey were £2070 5s. 8d. Hence the greater part of the increase in the expenditure already mentioned. The surplus transferred from the revenue account to the dividend and interest account was £43,685 7s. 4d. After payment of interest on the bond debt and the debenture stock, there remained an available sum of £43,439 2s. 5d., out of which the Directors recommended to the Proprietors the distribution of a dividend at the rate of 7 per cent. per annum (less income-tax), which it was estimated would amount in all to £41,400, leaving a balance of £2039 to be carried forward. The Directors further reported that the parishes in the metropolitan area had not hesitated to take advantage, as against the Company, of the quinquennial valuation (1880) under the Metropolis Valuation Act, 1869. The Company, however, had taken no advantage of this valuation of 1880, and in no case were their water-rents assessed upon any higher valuation than that made by the parishes in 1875, but, in the majority of cases, upon a considerably lower valuation.

The Engineer reported as follows:—

The new filtration works at Ditton are going on satisfactorily. The service reservoir and three of the filters are finished, and the fourth filter, which completes the set, is in an advanced state of progress, and will be completed in about a month from the present time. The buildings for receiving the new pumping-engines and machinery, for raising the water to the new filters, are completed, and the engines and pumps are being erected. The whole of the works will, it is hoped, be completed, and the new filters brought into use in January next. The entire filtering area will then be sufficient to filter the water at the most approved rate of filtration, and it is anticipated that the quality of the water will thereby be appreciably further improved. The Company's works generally are in good repair and efficient working condition.

In regard to the extension of the constant supply system, the Directors reported in the following terms:—

The extension of the constant supply is proceeding satisfactorily, though more slowly than the Directors wish, through the culpable neglect of many landlords to put the fittings of their houses in order. Proceedings are, however, being taken by the Directors to enforce what is necessary. At present great waste of water, as well as considerably increased expense to the Company, is the result of giving constant supply; but in some sub-districts, by efficient waste inspection, not only has the waste been stopped, but a great reduction effected in the consumption as compared with intermittent supply. It is anticipated that the same satisfactory results will be brought about generally. The number of houses to which constant supply has been given in the two years ending Sept. 30 last, is 9220; the total number receiving constant supply in the whole district is 13,048. In 12,387, the Board of Trade regulations as to fittings which are absolutely necessary for the prevention of waste have been complied with. This general constant service is entirely the voluntary act of the Company, arising from their desire to fulfil in this respect the wishes of the Legislature, and in no case has the Public Authority requested the Company to afford constant supply.

The somewhat lengthy statement concludes in the following way:—

The report of the Select Committee of last session on London Water Supply has for some time been before the public. The Directors would observe with regard to parts of that report relating to the agreements made by the late Mr. E. J. Smith on behalf of the Government with the Companies—

(*a.*) That the market value of the shares to which reference is made by the Select Committee was not considered in connection with the question by the Board. The shares of the Company had been mainly held as permanent investments, but little known on the Stock Exchange, where it was often difficult to obtain a quotation of price. In fact, what is called the "market price" was no indication of the real value of the shares. The object of the Directors in the negotiations was to secure to the Proprietors the present income, and the income in reasonably near prospect on the subscribed capital, whether by way of annuities or interest derivable from water stock was immaterial. The question of back dividends did not arise in connection with this Company, nothing in respect thereof having been agreed to by the late Mr. E. J. Smith.

(*b.*) Then again the Select Committee called evidence which proposed to prove, or rather to argue (altogether erroneously), that inasmuch as the percentage of increase in this Company's net water-rental in nine years was more than twice as much as the percentage of increase in the number of houses, it necessarily followed, and the Committee therefore reported, that a considerable portion at least of the increase in the Companies receipts was due to the rates having been revised—that is, raised. Even if that had been the cause of the increase of income, it would have been quite legitimate, but nevertheless the inference was erroneous on the part of the Select Committee. The value of so hostile an argument will be further realized when it is stated that the total increase in the Company's income, due to revision of rates, in the seven years ending Lady-day last (1880), was £3477, or less than £500 a year out of the total annual rental at that date of £153,970.

(*c.*) The Company's income for the year ending March 31 last was actually in excess of that allowed by the late Mr. E. J. Smith for the year ending June 30, 1881, by £183, and with regard to the increment, the increase of rental in the last half year is more than was anticipated, and 418 more houses have been laid on during the past twelve months than in any previous like period.

(*d.*) A further error on the part of the Committee arose from their having called and been guided by evidence given purely from an accountant's point of view, to the effect that because in the last nine years a large amount of expenditure on permanent works had taken place, it must be assumed and calculated that the same rate of capital expenditure must necessarily continue in the future, and so postpone the increase of income as bearing upon the negotiation with Mr. E. J. Smith. This was, in fact, affirming that the Company who had spent most and done everything necessary to put their works on a permanent good basis, must continue to spend most in the future. The Lambeth Company in recent years have laid out nearly a quarter of a million in removing their intake to Molesey, and there constructing large subsiding reservoirs, building on suitable high ground capacious new service reservoirs, extending the filtration area, and putting their works generally in an efficient state, and the Proprietors will understand that as this expenditure will not, of course, recur, the argument for the reduction of increment indicated by the evidence alluded to cannot be sustained, while the increment agreed between Mr. E. J. Smith and the Company is substantiated.

(*e.*) With regard to the possibility of some public body obtaining the sanction of Parliament to establish a competing supply with the public funds, the Directors would observe that the preambles of this and other Companies Acts of Parliament state that the money of private enterprise is called in to do a work which Parliament has decided to be "for the public benefit," no public authority having come forward as able and willing to do the work. In fact, private enterprise has stepped in because of the default of public spirit in any public body. The source from which the supply of water is to be taken by the London Water Companies is prescribed in their Acts. This supply has been declared by various Parliamentary Committees, and by the Royal Commission of 1879, to be "good and wholesome," and it is ample in amount. The question whether the Water Companies have or have not a monopoly does not arise; they have, as private enterprises, obtained property for certain consideration defined in their Acts. If the public covets such property, or seeks the sanction of Parliament to injure it, due compensation must be made in the first instance. Without prior compensation Parliament does not permit public money to be used to compete with, and diminish the value of parliamentary private enterprise. Upon the faith of this great principle all parliamentary private enterprise has through generations been built up, and many millions of private money have been invested. If it were violated there is no parliamentary company which could not be annihilated by the use of public money in the construction of duplicate competing works—a railway, for instance, by parallel lines—and no property would be safe.

## BOMBAY GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held at the London Offices, Drapers Gardens, Throgmorton Street, on Thursday, the 25th ult.—D. T. Evans, Esq., in the chair.

The Secretary (Mr. W. Marshall) read the notice convening the meeting, and the following report and statement of accounts were presented:—

Your Directors have pleasure in submitting a statement of accounts, duly audited, for the half year ending the 30th of June last.

The gas and meter rental, as compared with the corresponding half of last year, also with that of the half year ending the 31st of December, shows a steady increase. The sales of residual products show also a satisfactory advance.

Exchanges have been and still are adverse for remittances to England; but as no money has been brought over during the six months, no loss has been incurred. In the meantime, the Company's funds have largely accumulated in Bombay; these, placed on deposit, bear interest at 5 per cent. per annum. Your Directors, watching closely the exchanges, were enabled to bring home recently a large sum at a favourable rate, and this they hope to do again. To provide against losses on remittances, which must occur during the current half year, your Directors have charged the profit and loss account with the sum of £3500, which they have placed to the credit of exchange equalization account.

After eight years of continuous service in Bombay, the Engineer and Manager, Mr. Scott, came to England on three months leave, but has returned and resumed his duties.

The amount at the credit of profit and loss for the half year is £8757 19s. 3d., which added to the sum of £105 12s. 8d. brought forward from last half year makes a total of £8863 11s. 11d. available for dividend. Out of this your Directors have declared an interim dividend of 3½ per cent. for the half year, clear of income-tax, leaving a balance of £463 11s. 11d. to be carried forward.

The interim dividend will be payable on and after the 1st of December next.

*General Balance, June 30, 1880.*

| Dr. | | Cr. | |
|---|---|---|---|
| Capital authorized— (50,000 shares, at £5 each— £250,000.) | | Construction account | £203,662 5 0 |
| 40,000 shares, £5 paid | £200,000 0 0 | Retort account | 1,376 18 6 |
| 10,000 shares, £4 paid | 40,000 0 0 | Services account | 61 6 0 |
| | £240,000 0 0 | Goods in transit | 215 18 17 |
| Amount owing by the Company | 9,162 17 1 | Stocks, viz.— | |
| Reserve-fund (equalization dividend account) | 311 12 8 | Chandeliers, brackets, &c. | 4,519 7 6 |
| Reserve-fund (for depreciation of plant, &c.) | £2,775 14 7 | Brass and iron goods | 5,103 12 10 |
| Written off | 398 12 10 | Mains, services, and tools | 1,635 15 10 |
| | 2,377 1 9 | Meters | 3,227 12 11 |
| Exchange equalization acct. | 3,500 0 0 | Coal | 12,729 5 0 |
| Insurance-fund | 1,920 14 3 | Residual products | 92 15 5 |
| Passage-fund | 27 2 2 | Amount owing to Company | 4,940 11 8 |
| Balance to general revenue account | 8,863 11 11 | Invested funds — Victoria Government 4½ per cent. Debenture Railway Loan. | 1,842 15 0 |
| | | Cash at Bankers, on deposit, and in hand, viz.— | |
| | | In Bombay | £20,049 1 1 |
| | | In London | 6,705 14 6 |
| | | | 26,754 15 7 |
| | £266,162 19 10 | | £266,162 19 10 |

*Profit and Loss Account.*

| | | | |
|---|---|---|---|
| Coal carbonized | £8,079 7 5 | Gas and meter rental | £20,400 6 1 |
| Wages | 1,190 5 9 | Coke, tar, fittings, &c. | 4,338 3 11 |
| Purifying | 29 2 3 | Interest | 397 3 11 |
| Trade and general charges | 675 0 4 | | |
| Salaries and Collectors commission | 1,803 17 7 | | |
| Rents, rates, and taxes | 375 16 4 | | |
| Directors & Local Audit Committee's remuneration | 701 5 0 | | |
| Bad debts | 7 9 1 | | |
| Law charges | 15 10 11 | | |
| Exchange account | 3,500 0 0 | | |
| Balance | 8,757 19 3 | | |
| | £25,135 13 11 | | £25,135 13 11 |

*General Revenue Account.*

| | | | |
|---|---|---|---|
| Balance carried down | £8,863 11 11 | Balance, Dec. 31, 1879 | £9,705 12 8 |
| | | Less dividend paid June 1, 1880 | 9,600 0 0 |
| | | | £105 12 8 |
| | | Balance for half year ending June 30, 1880 | 8,757 19 3 |
| | £8,863 11 11 | | £8,863 11 11 |
| | | Balance for appropriation | £8,863 11 11 |

The Chairman, in moving the adoption of the report, said the report and accounts before the meeting spoke for themselves, though he might be able to supplement them with some statements that would perhaps be interesting. The Shareholders would observe that there was an increase in the gas and meter rental, as compared with the corresponding period of last year, of £189. This was a small amount, and he knew some disappointment had been experienced and expressed by gentlemen who had recently joined the Company, that though the Board stated from time to time that there had been a small increase in the gas-rental, it did not tell on the dividend. Nevertheless there had been continuously an advance. To go back—say for seven years—in the June half of 1873 the quantity of gas sold was 10,047,200 cubic feet, while in the half year under review it was 12,668,300 cubic feet. It might be said that this was not a very considerable increase, but it was as from 10 to 12 millions, or one-sixth in seven years. In the December half of 1873 the gas sold was 10,093,300 cubic feet, and in the same period of 1879 the figures were 12,231,900 cubic feet. This was for the private lights; and he need not refer to the public lights, except to state that the quantity of gas sold was about double that of the private consumption. There were various reasons operating against the Company in the matter of increasing the private lighting. It should be remembered that Bombay and an English city stood in very different relations. The European population of Bombay was a mere handful as compared with the Native, and the Directors had, so to speak, to indoctrinate the natives, who were an inert and sluggish body, to move in appreciation of the advantages of gas. Nevertheless, he thought the Company might congratulate themselves that, notwithstanding this very serious obstacle, they were making considerable way even among the native population. It should also be borne in mind that India had had four successive years of famine, and was now burdened with a heavy

war, and it could not be otherwise than that this must have had a very serious effect on trade in Bombay as in other cities of the country; and if on trade, it must also have had a prejudicial effect on the revenues of the Company. There had existed strong motives for economy in Bombay. He might mention that twelve months ago, when the Chief Commissioner brought before the Municipality the Budget, proposing an increase of from 70 to 80 in the number of the public lamps—it was not a very large increase, but it showed a desire on the part of the Chief Commissioner to extend the benefits of public lighting to various districts—the proposal was rejected on the ground that it could not be afforded. Then again there was the serious loss on exchange. These were some of the reasons why the Company were unable to pay a higher dividend.

Mr. H. S. WILDE asked if the rates were the same in 1873 as now.

The CHAIRMAN, in reply, said at one time the Company charged 7 rupees. There was a reduction in the charge for the private consumption between the periods mentioned, from 7 to 6 rupees.

Mr. H. P. STEPHENSON: It was in the former period 7 rupees, with an allowance for prompt payment, and it is now 6 rupees without any allowance.

The CHAIRMAN said in the coke, tar, and fittings there was the satisfactory increase of £718. There was a great increase in the sums deposited bearing interest in Bombay, where the Company now had a very large amount lying, because they could not bring it home without serious loss. It was 300,000 rupees, which was equal to £30,000. The Directors had been most carefully watching the exchanges, and had brought over £5000 at 1s. 8¼d., and had given instructions for a further large sum to be sent over at this rate, and a still larger amount if the exchange should touch 1s. 8⅜d. All this money was bearing interest at 5 per cent., while, such was the credit of the Company here, that they could borrow at ½ per cent. above the Bank rate—at 3 per cent.—so that they had the benefit of 2 per cent. by this operation. They were, however, anxious to have the money sent home as soon as they could, and they were therefore, he repeated, watching the exchanges very closely. They had had in the half year no loss by the exchanges, because they had had no remittances; but they had thought it advisable to apply £3500 out of revenue to meet the loss which must occur in the current half year. During the half year their coal had cost them 1s. 6d. per ton more than in the corresponding half of last year, showing an increase of £893. This was owing to higher rates of freight, and also to an increase in the cost of the coal. He regretted to state that the leakage had increased from 10 to 16 per cent. This was in great part owing to a fracture of the mains by the Municipality, in the course of making some new sewers. A claim had been made by the Company's representative, Mr. Scott, who always watched their interests with great zeal and activity; and he (the Chairman) believed that something would come out of the claim. The leakage was now reduced to below what was considered the normal amount—10 per cent. As regarded the stock of coal, the Company had derived great advantage from buying this article cheap, and freights being low. The Directors used to think themselves very fortunate if they put coals into the works at 40s. per ton; but they now placed them there considerably below this figure. They had a stock of 4200 tons at the works, and 3000 tons in transit, so in point of fact they had provided for one year's supply. With regard to the works themselves, provision was made for depreciation, and they were kept in excellent condition; there was, in fact, nothing to be wished for in this respect. The Directors hoped the public lighting would extend. They had not been furnished with particulars of the Budget for this year, but he hoped the Municipality, as recommended by the Chief Commissioner last year, would be able to take 70 or 80 additional public lights. If the Government should do what they were very much pressed to do—bring out a loan for India, and cease for a time the weekly drawings of £300,000—it would be greatly to the benefit of the Company. Instead of being able to divide only 7½ per cent., they could divide 10 or 10½ per cent. perfectly well if the exchanges were reasonably favourable. He remembered the time, since the Company had been formed, when the rupee was worth 2s. 2d. He did not despair of eventually seeing it up to par again—2s. Even now things were improving in Bombay, though as yet the Company had little profited by the impovement. He did not fear as to the future of the Company. The lighting had considerably increased by the new docks, and an important district was being built over which would require gas, so he thought the Company's prospects were reasonably fair for the future.

Major W. F. GORDON seconded the motion.

Mr. NORTHOVER thought the Shareholders would be glad to have some information as to the large increase in the amount owing by the Company. There was also a little difference in the balance-sheet, in the shifting of the two reserve-funds; but this he supposed was to be accounted for by the Shareholders having had the money as dividend. The increase in the Company's business was small, and he had hoped the balance-sheet would have shown something better. It was, however, matter for congratulation that the coke, tar, and fittings had increased, as it showed that the residual products were no mean help to the dividend.

The CHAIRMAN, in reply, stated that the increase in the amount owing by the Company was due to their having been compelled to borrow from their bankers; but, as he had stated, they made 2 per cent. by the course they had adopted.

Mr. WILDE observed that his object in asking about the price of the gas was this: He was a Director of the Bombay and Baroda Railway Company, and he knew the officers did not use gas because of its high price. It seemed to him that the Directors might consider the question of reducing the price. A slight reduction would probably be a loss, but he thought the Directors might consider the advisability of making a large reduction. He considered, speaking generally, that the price of coal in Bombay might be taken at about double that charged here, but the price of gas was considerably more than double. Could nothing, he asked, be done to induce the use of gas for cooking purposes in Bombay? The price of fuel was high, and the inhabitants did not want fires for warming purposes.

The CHAIRMAN stated that the Directors had endeavoured, in every possible way, to introduce the use of gas for cooking purposes. They had sent out rings and various forms of burners for cooking, and what they were doing now with advantage was enhancing the price of coke by expanding the area of its use. They had sent out a number of stoves to consume their coke, and there was a demand for them, and this would assist materially in keeping up the price.

Mr. WILDE considered the Directors might do more in the direction indicated, by advertising and calling attention to the matter by public exhibitions. He also thought the Shareholders would find it of advantage if, when the accounts were sent out, the figures of the corresponding period were given in the margin.

The CHAIRMAN said the Directors would bear the suggestion in mind, but it would add considerably to the expense.

Mr. STEPHENSON said it was most unusual to do this.

Mr. WILDE asked the total loss made in bringing over the £5000 referred to by the Chairman. He saw that the Directors had put aside £3500 out of last half year's revenue to meet the loss on exchange in the current six months. Did they think that another £3500 out of the present half year would cover the loss?

The CHAIRMAN said they could not possibly say. Every farthing that the rupee was under the nominal sum of 2s. was equal to 1 per cent. They brought home the £5000 at 1s. 8½d., so that this would be 14 per cent. below the 2s. They therefore only received £86 for £100.

Mr. STEPHENSON said that Mr. Wilde had suggested that the Company should make a large reduction in the price of gas. In 1876 they made what they considered a large reduction—2s. per 1000 feet—and he must say that he for one was very greatly dissatisfied at the result. Had this reduction been responded to in Bombay, the Directors would have been prepared, he thought, to make another large reduction. Suppose they acted on Mr. Wilde's suggestion, and did not get an increased consumption, the Shareholders would have to go without dividend. This question had been most carefully considered by the Directors. He did not believe the Shareholders generally would consent to the adoption of a course which would imperil the dividend they were now receiving. The Directors had tried one experiment, having reduced the price by one-seventh, and they found no adequate corresponding increase in the consumption. He therefore contended that they must wait before making a further reduction.

Mr. ALFRED PENNY said he knew of no company where the Directors were more anxious than in this to give the fullest information to the Shareholders, or where they showed more interest in the concern. The Company's gas and meter rental the corresponding half of 1879 was £20,211, and in the past half year it was £20,400—an infinitesimal increase; and remembering what the Chairman had said in reference to the lighting of the new docks, he thought it was very discouraging. As to reducing the price, had it occurred to Mr. Wilde to take into account the fact that 12s. really meant with them only 10s.?—that was all which came into their exchequer. He could, therefore, see no good to the Company in reducing the price, and those who were shareholders in other foreign companies, particularly those in South America, would remember that the price of gas there was £1—just double that charged by the Bombay Company, and the price of the coal with them was about the same as with the Bombay Company. Some of those companies also had this advantage, that they had an agreement with the municipal authorities—at all events for the public lighting—that they should be reimbursed for loss by exchange. As far, therefore, as he was concerned, as an expert, he held Mr. Stephenson's view—that the experiment tried of reducing the price having produced no appreciable result, the Company ought to keep to their present price. On a previous occasion he called attention to the fact that the reserve-fund was slipping away, being used to maintain the dividends. He saw now that it was reduced to the vanishing point, and he wanted to know, in face of this fact, if the dividend was likely to be maintained. Judging by the market price of the shares, some people seemed to think that the dividend would not be maintained; but he was sure that whatever could be done would be done by the Directors. If the exchange should go up, and the Company received the money that appeared on the credit side of the account to divide, they would be very prosperous, but if they continued to lose £7000 or £8000 a year by the exchange, the dividend would have to be reduced unless that normal increase took place in the consumption which had tided many gas companies in England over their difficulties. If the consumption increased, the Company would very soon get over the present difficulty. It was beyond the control of the Directors to increase the consumption, and he believed the increase would be trifling, even if the price were reduced. He thought they ought to reduce the amount put down in the balance-sheet to some fair rate of exchange—say 1s. 8d. or 1s. 8½d. He did not believe they would see the rate of exchange very much higher for some time to come.

Mr. WILDE said his reason for suggesting a reduction in the price of gas was this—that as there was comparatively no increase in the consumption, in spite of the spread of towns and the increase of railway stations, he thought there must be some reason for it; and the only reason which occurred to him was the price.

Mr. C. GANDON stated that during the time he was in Bombay the question of the price of the gas was very seriously discussed. He then held that it would be perfectly useless, as far as increasing the consumption was concerned, to make a small reduction in the price. No doubt 6 or 7 rupees was a high price for gas, more especially when compared with the price of petroleum, cocoa-nut oil, and other lighting material; but any small reduction, such as a rupee, would, in his opinion, do very little to increase the consumption. If the Company could reduce the price from 6 to 3 repees, it might do so; but even then it would be doubtful, because the majority of the natives were satisfied if they could get a tumbler and put some cocoa-nut oil and a wick in it, and so get their light. As to the public buildings, he believed that whether the price was 6 or 7 rupees, the result would remain the same as to the amount of the consumption. He thought it would be very rash to attempt to reduce the price by one-half, for he believed if they did the Shareholders would lose their dividend.

Mr. STEPHENSON said the question of the exchange had been fully thrashed out at previous meetings, and he believed that the Shareholders generally were of opinion that the Directors, knowing all the circumstances of the Company, were right in continuing the course hitherto followed. As to the amount now owing by the Company, £8000 of it was due to their bankers for a loan against the money they had in Bombay. He agreed that there was no objection to showing the items separately, as suggested, and it would perhaps be more clear to do so. As to the reserve-fund going down to £311, no doubt that was so on capital account, but there was an exchange equalization account of £3500. His belief was that their loss by the exchanges ought not to be more than from £5000 to £6000 a year. He did not take a very rosy view of the position of the Company; but he was very far from having arrived at the conclusion that the dividend was on the point of being reduced. It was true that the gas-rental for the past half year showed an increase of only £200 over the corresponding period of 1879; but, owing to the flooding of one of their mains (due to a fracture) a whole district was put in darkness for some time. In the month of June alone their consumption decreased 128,000 feet, followed in July by a drop of 149,000 feet. Their Manager being absent on leave at the time, a longer period elapsed than would have otherwise been the case before the damage was remedied. That was one of the reasons why the increase in the rental was not larger. Should the Directors find themselves pressed to reduce the dividend, he was not quite clear that the proper course would not be to increase the price of the gas if the exchanges continued so low.

The CHAIRMAN pointed out that the general balance also showed that they had £1842 invested in the Victoria Government 4½ per cent. railway loan; and this was now £2000, being the investment of the insurance-fund.

The motion was then put, and carried unanimously.

Mr. NORTHOVER, after expressing his belief that Mr. Stephenson's concluding remarks were right as to the dividend being maintained, moved a vote of thanks to the Chairman and Directors.

Mr. WILDE seconded the motion, and it was carried unanimously.

The CHAIRMAN, in reply, expressed the acknowledgments of his colleagues and himself, and assured the Shareholders that they would continue in future to do what they had done in the past—their very best in the interests of the Company.

The proceedings then terminated.

## METROPOLIS WATER SUPPLY.

The following are the returns made by Dr. C. Meymott Tidy, on the Composition and Quality of the Metropolitan Waters in November, 1880:—

[The results are stated in grains per Imperial gallon of 70,000 grains.]

| Names of Water Companies. | Total Solid Matter. | Oxygen required by Organic Matter, &c. | Nitrogen.—As Nitrates, &c. | Ammonia. | Hardness (Clark's Scale). | |
|---|---|---|---|---|---|---|
| | | | | | Before Boiling. | After Boiling. |
| *Thames Water Companies.* | Grs. | Grs. | Grs. | Grs. | Degs. | Degs. |
| Grand Junction | 22·42 | 0·071 | 0·146 | 0·001 | 15·4 | 2·4 |
| West Middlesex | 21·83 | 0·128 | 0·146 | 0·001 | 15·4 | 2·4 |
| Southwark and Vauxhall | 21·97 | 0·088 | 0·167 | 0·000 | 15·4 | 2·0 |
| Chelsea | 21·75 | 0·044 | 0·156 | 0·000 | 15·4 | 2·4 |
| Lambeth | 23·03 | 0·051 | 0·167 | 0·000 | 15·4 | 2·4 |
| *Other Companies.* | | | | | | |
| Kent | 32·02 | 0·000 | 0·413 | 0·000 | 22·4 | 5·6 |
| New River | 22·91 | 0·004 | 0·198 | 0·000 | 15·4 | 2·4 |
| East London | 22·53 | 0·077 | 0·177 | 0·000 | 15·4 | 2·4 |

*Note.*—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, the Grand Junction Water Company.

## NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

The Corporation of Glasgow, like many others I could mention, have no reason to be dissatisfied with the results following upon their acquisition of the gas-works; but in view of the proceedings of the Gas Commissioners, which have just been published, it is questionable whether the gas consumers of the city will feel at all gratified. No doubt the Corporation have been able to produce gas more cheaply than was done by the private companies in former days, and they have also maintained a high standard of illuminating power. For this they deserve credit, as well as the best thanks of their constituents; but it is perfectly evident that they have not reached the lowest limit of profit on the make of gas, else less would be heard about a "handsome surplus" than has been the case. The natural reasoning of nearly every person interested in these matters is that the profits realized, if not arising from any exceptional occurrence or event, should go to reduce the price at which the manufactured article ought to be sold. Unfortunately for those more immediately concerned with the making of gas, corporations do not look upon the subject from the same point of view, and serious injury is thereby inflicted. Arguing upon the basis that every department under the charge of a corporation ought to stand upon its own legs, it is unfair to take from the one in order to prop up the other; yet this is what is being done in Glasgow at the present moment. Conditional upon the Corporation as a whole granting £5000 to carry out certain improvements in George Square, the Gas Commissioners have resolved to grant a similar sum out of gas profits. It may be, as Bailie Osborne pointed out, that there is great necessity for improvement in this central part of the city; then why not assess for this object? By taking the profits realized from the sale of gas the Corporation practically saddle the gas consumers with the expense of the improvements, and allow the non-consumer, who is equally, as a citizen, bound to pay for improvements, to go free. Apart, however, from this, there is the further consideration that every opportunity is seized by those interested in the establishment of the electric light to draw comparisons unfavourable to gas on the score of expense, and it therefore behoves corporations to see that they not only manufacture gas at the least possible expense, but that they sell it with the narrowest margin of profit.

Unlike Helensburgh or Kilsyth, the Police Commissioners of Alva, a small town in Stirlingshire, have resolved to adopt the Burgh Gas Supply (Scotland) Act, 1876. The movement to acquire the gas-works of the town originated several months ago, and at a meeting of the Commissioners on the 22nd of September last it was resolved unanimously to adopt the Act. An election has intervened since the resolution was come to, and on the 29th ult. a meeting of the Commissioners was called to resume consideration of the matter. Chief-Magistrate Donaldson, who presided, said that since the meeting in September he had seen no cause to change his mind in regard to taking over the gas-works. He believed that the confirmation of the prior resolution would be for the profit and benefit of the ratepayers, and he therefore formally moved the adoption of the resolution. The motion was unanimously approved of, and the usual notices will consequently be served upon all parties interested.

In the number of the JOURNAL for the 23rd ult. I mentioned that the Corporation of Montrose had resolved to adopt the Burghs Gas Supply (Scotland) Act. It would now seem that the policy of the Corporation is not to be allowed to pass unopposed. On Thursday last two separate remonstrances, said to be numerously signed, were lodged with the Town Clerk of the burgh, against the transfer of the gas-works to the town. Of course, this action will necessitate a poll being taken.

A question has arisen in Inverness, the capital of the Highlands, upon a point of peculiar importance to gas consumers. At the last meeting of the Gas and Water Commissioners, on the 25th ult., Mr. J. H. Mackenzie desired the Gas Manager to explain how it was that gas at 6s. 8d. per 1000 feet cost more in the long run than it did at 7s. 6d. per 1000 feet. He said that his experience had been that gas at the former figure cost him more than it did at the latter. It would appear, from the remarks made at the meeting, that there is a feeling generally prevalent in the city that the reduction in the price of gas per 1000 cubic feet does not in the slightest degree mean that the account at the end of the quarter is less than formerly. Of course, the first and most natural solution of the point is that the consumer has been burning more gas, but this does not appear to meet the difficulty. Perhaps some of the readers of the JOURNAL may be able to proffer a satisfactory explanation to Mr. Mackenzie.

I would ask that this question should be solved for another reason. I find the same complaint quite commonly made in Hamilton. The price of gas there has also been reduced, but many of the consumers, including even those who have adopted the most improved methods for economically burning gas, are loudly grumbling that their gas accounts are not only not reduced, but largely increased. If Bailey Cassels has not yet completed his inquiries to satisfy the queries which I put two weeks ago, he might address himself to this further question, and if he is able satisfactorily to solve the problem, he will at least have done something in connection with gas management to merit the applause of his fellows.

A scheme has been adopted to supply North Queensferry with water from the Dunfermline pipes, and an intimation has been made to the Public Works Loan Commissioners that the Local Authority would require to borrow not less than £2000 to finish the work. It should be mentioned that a protest was made against the scheme because it would give 50 gallons of water a day to each individual. Had the protest been against the limitation of the supply, it might have been better understood.

Mr. Dallas, the Manager of the Inverness Water-Works, has had a busy time of it recently in trying to prevent the waste of water, and in this way to keep as large a supply as possible in store for the inhabitants. In many instances he has succeeded in effecting a great saving, and now, thanks to his exertions and the heavy fall of rain within the past week or two, the store of water in the reservoir is fast increasing. The reservoir now contains 6,109,000 gallons, or a gain of 1,698,000 gallons (60,000 gallons a day) since the 27th ult.

The scheme to lay down new pipes, with the view of strengthening and improving the carrying power of water from Lintrathen to the Clatto reservoir, has been abandoned by the Dundee Water Commissioners, but it is plain that unless action of some kind or another is speedily adopted the Water Commissioners and the people of Dundee will be placed in a very awkward predicament indeed. Sir George Kinloch, one of the proprietors of land through which the water-mains pass from Lintrathen to Dundee, has written to the Commissioners complaining of the injury to his lands by the frequent bursts, and calling upon the Commissioners to do something to strengthen the pipes in Strathmore. It will now come to be a question whether it would not be more advisable to lay an additional main than to endeavour to strengthen the present one. Consideration of the question has been reserved.

The statistics which have been published this week relative to the Edinburgh water supply fully bear out my statements last week as to its abundance. The report which has been made up to the 30th ult. shows that at Torduff and Clubbiedean the rise within the fortnight was upwards of 25 feet. The total quantity in the reservoirs on the 30th was 2,357,147,000 gallons, as compared with 2,319,973,000 gallons on the 16th ult. The delivery in Edinburgh was 12,183,000 gallons per day—equal to 40·03 gallons per head per day to a population of 304,300.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

A petition was heard yesterday in the Dean of Guild Court, Port-Glasgow—Bailie Cuthbert on the bench—on behalf of the Trustees of the Clyde Lighthouses, for leave to erect sheds, stores, and other buildings in connection with the gas-works proposed to be erected on ground recently purchased by the Trustees, and which are intended for the manufacture of gas (as mentioned in the JOURNAL several weeks ago) for the purpose of supplying buoys similar to that which was placed by the Trustees on Roseneath Patch some time since. The gas is to be manufactured from mineral oil, and it was brought out in evidence before the Court that there would be no chimneys in connection with the works, so that there was no likelihood of any nuisance arising from smoke. It is expected that the work of construction will be commenced forthwith.

The photometric testing of the gas supplied to the town of Greenock during last month showed, in 26 experiments, a minimum illuminating power of 25·00 standard candles, a maximum of 32·80 candles, and an average of 28·48 candles. As formerly mentioned, the experiments are made in the office of the Clerk and Collector, well-nigh two miles from the gas-works.

At last Thursday's meeting of the Town Council of Glasgow, sitting as the Gas Commission, the question of the disposal of £5000 from the gas surplus of last year was up for consideration. Mr. Walls, Convener of the Gas Committee, proposed that it should be handed over for the general purposes of the Corporation, on condition that a similar amount be applied to the improvement of George Square. The proposal gave rise to some discussion, and an appeal to, and an interpretation of one of the sections of the Gas Act, and one of the members strongly urged that the surplus funds of the Gas Trust should be applied to the reduction of the price of gas. A large majority voted in favour of the motion. It was also resolved at the same meeting to write off 2½ per cent. from the value of all the works, except meters, and charge the deduction to profit and loss. This resolution seems to have been arrived at in view of the possible competition of the electric light. The Gas Committee recently had an application for a supply of gas for the districts of Clarkston and Busby, several miles to the south of Glasgow, but it was resolved to decline granting the same, unless the applicants would undertake to pay the whole expense of the necessary piping.

The annual monthly meeting of the Town Council of Kilmarnock was held last Wednesday, when there was submitted a report from the Gas Committee which stated that £9000 of debenture bonds would become due next Whitsunday, by which time £1500 would be available for the redemption of those bonds, and by anticipating part of the payment on account of sinking-fund, £2000 might be paid off, in which case only £7000 would have to be borrowed. During October 2,901,100 cubic feet of gas were sold, realizing £664 16s. 8½d., as compared with 2,779,000 cubic feet, value £636 17s. 1d., sold in the corresponding month of last year. The illuminating power of the gas made in October was—maximum, 28 candles; minimum, 26; average, 26·9 candles.

At a meeting of the Police Commissioners of Wishaw, held on Thursday, the Town Clerk reported that he had called a meeting of the Gas Committee to learn what was to be done, seeing that the proposed lenders of money for the gas-works objected to implement their engagements, owing to what they considered irregularities in complying with the terms of the Act on the part of the late Town Clerk. The memorandum was read showing what had been done and wherein there was any difference with what was mentioned in the clauses of the Burghs Gas Supply Act. From the Lord Advocate there was submitted a lengthy and very clear opinion on the matter, which was to the effect that the Sheriff had supreme power in the matter, and that his decision was not subject to review, and that what had been done latterly had covered any small previous irregularities.

Business was done last Monday in the Glasgow Corporation 6¼ per cent. Gas Annuities at £164 per share.

The decision of the Town Council of Paisley to ask for parliamentary powers to spend £100,000 on a new water supply scheme is causing a good deal of discussion in Johnstone, which is supplied by the Paisley Water Commissioners. Considerable alarm has been created by the statement that a large increase in the rates will be necessary to meet the expenditure, and there is some talk of convening a public meeting of the ratepayers so as to have the matter discussed and their opinion obtained upon it.

There has been a quiet tone in the Glasgow pig iron warrant market during the week, and a large amount of business has been done daily. A recovery of 4d. per ton took place yesterday, but over the week there was a decline of 6d. per ton, the close being buyers 52s. cash and 52s. 2d. one month, and sellers asking 1d. more per ton. The demand for iron from France and Germany has fallen off to some extent.

The coal market presents no new feature this week. The shipping demand has been rather slacker, owing to the stormy weather keeping back steamers and sailing vessels. There are now, however, a few inquiries. The house coal demand is not busy. Prices remain without alteration.

## THE PURCHASE OF THE COLCHESTER WATER-WORKS BY THE CORPORATION.

At the last Meeting of the Colchester Town Council, the Water Supply Committee presented a report which stated that the purchase of the water-works was completed on Oct. 27, on which day possession was formally delivered over to the Mayor, in the presence of the Town Clerk and Treasurer, so that the management of the works, on behalf of the town, now devolves on the Corporation. In regard to the cost incurred in carrying out the transfer, the Committee reported that the settlement of the purchase proceeded on the following statement of accounts, made out in pursuance of the agreement which was sanctioned by the Colchester Water-Works Act, 1879:—

| | | | | | | |
|---|---|---|---|---|---|---|
| Purchase-money under awards . . . . . | | | | | £81,218 | 10 4 |
| Interest (less property tax) from June 30, 1879, to Oct. 17, 1880 . | £5,111 | 1 | 2 | | | |
| Less balance on income account rendered by vendors up to Sept. 30, 1880 . . . . . | 2,431 | 17 | 3 | | | |
| Interest balance. . . . . | | | | | 2,679 | 3 11 |
| Moiety of Arbitrators charges . . | £341 | 1 | 8 | | | |
| Costs of action, and costs under memorandum of April 17, 1879 . | 300 | 0 | 0 | | | |
| Stamp duty on mortgages . . . | 29 | 7 | 6 | | | |
| | | | | | 670 | 9 2 |
| Total to be paid . . . . . | | | | | £84,568 | 3 5 |
| Amount of cheque given . . . . . | | | | | £83,568 | 3 5 |
| Purchase-money left due on memorandum . . . | | | | | £1,000 | 0 0 |

The "memorandum" referred to in the above statement was the following, which was duly signed:—

That, inasmuch as the amount of the purchase-money, interest, and costs is so much more than the Corporation expected, and the amount claimed by the vendors on settlement cannot be provided by £1000, the Committee unanimously request the vendors to allow the £1000 to remain unpaid, and without interest, to a day not later than the 30th of June next, before or by which time the Committee will see that this balance of £1000, which is left as unpaid part of the purchase-money, shall be paid; and, if not then paid, the £1000 to bear interest at 4 per cent.

The report, after asking the approval by the Council of the Committee's arrangements, continued:—

In addition to the £1000 balance of purchase-money paid, there are other claims in respect of the purchase still to be provided for, and in further dealing with this subject, your Committee recommend that all these outstanding claims should be ascertained as soon as can be, and that the additional amount required to discharge them should be borrowed. The sanction of the Local Government Board to the borrowing of any further sum for the purpose will be necessary, and if you adopt this view of your Committee, the accounts should be at once got in, and the matter brought before you at the next meeting of the Council.

Another and still more pressing point is the management of the water-works, and of their income and expenditure. It was before stated that possession was formally taken on completion of the purchase, and reviewing the past proceedings of the Council, it may be thought, and on good grounds, that the objects for which your Committee were appointed had, on such completion, been accomplished, and that their functions were ended. Your Committee think this is so; but the interests of the town would not permit an interregnum, and therefore your Committee assembled on the following day, and made a temporary arrangement, under which one or other of their number, the Treasurer, or the Town Clerk, has since daily visited the works. Your Committee also made provision by which the servants of the Water Company were continued, so that no interruption of the water supply has taken place.

All this, however, was, as you will see, intended but as temporary; and your Committee conclude their labours with a recommendation to you to appoint another Committee, which might now properly be designated the Water Works Committee, to whom should be delegated the entire management of the water-works and of the receipts and expenditure, of the water supply, whether voluntary or compulsory, to all persons and bodies corporate, of the making and levying of all water-rates and payments in respect of water, and of all agreements with any person or body corporate for the supply of water, the giving of all or any notices in respect of water supply which may be required either by the Colchester Water-Works Act, 1879, or by the Public Health Act, 1875, or any Act or Acts or part or parts of Act or Acts, incorporated therewith, the employment and discharge of all clerks, servants, and other persons now, or who hereafter may be, engaged on or in connection with the works—in fact, all matters of every kind relating to the water-works and their management. This recommendation is based upon the consideration that the property, and the duties for your discharge in reference to it, are of such a character as almost always to require immediate attention, an oversight, and a care (often under emergency) that are utterly incompatible with a prior meeting of your body, which in its sanitary character has a regular monthly meeting, and would doubtless be specially convened more frequently if the suggested Committee thought it necessary.

Mr. BEAR moved that the report be received and entered on the minutes, and that all the transactions of the Committee in purchasing and carrying through the negotiations be approved and confirmed.

Mr. WICKS seconded the motion, which was carried.

## THE LANCASTER CORPORATION WATER-WORKS ARBITRATION.

The proceedings in the arbitration between Mr. Henry Garnett and the Corporation of Lancaster, which were opened at the Surveyors Institute, Westminster, on Oct. 11, before Mr. W. C. GULLY, Q.C. (see *ante*, p. 612), and after occupying four days were adjourned to suit the convenience of plaintiff's Counsel, were resumed on Friday, the 12th ult.

Mr. W. H. HIGGIN, Q.C., and Mr. HORACE BROWN again appeared for Mr. Garnett; Mr. R. E. WEBSTER, Q.C., and Mr. R. S. WRIGHT representing the Corporation of Lancaster.

The first witness called was Mr. *Bardsley*, who testified to having gauged the springs on plaintiff's land, and gave the results. His examination, together with some other evidence, occupied the entire day.

On the following morning Mr. *J. Farrar*, C.E., of Bury, gave evidence in support of that given by Mr. Bardsley, whom he had accompanied when gauging the springs, which he considered had been materially altered by the carrying out of the Corporation's water-works. Taking water from these springs would, he said, depreciate the value of the land for grouse-breeding purposes, and the fact that the servants of the Corporation would, from time to time, have to go on to the ground to examine the reservoirs, would also be an element of depreciation, inasmuch as an intending purchaser would see that he would not have the estate entirely to himself. In fact, the Corporation, by becoming joint owners of the property, depreciated it not only for sale, but for letting purposes. He treated the property as worth £10 an acre, and his total valuation amounted to £16,035.

Witness's statements and figures were confirmed by Mr. *J. Jackson*, C.E., and Mr. *Forster*, C.E., and the proceedings were then adjourned.

On Monday, the 15th ult., the proceedings opened with the examination of Mr. *A. Waterhouse*, one of Mr. Forster's assistants, who stated that he had gauged the springs on Mr. Garnett's estate. On the 24th of last May, Tarnbrook had 68,780 gallons running per day. No. 2 stream was giving out 5295 gallons on the same day, and No. 3 stream was running 28,826 gallons. This was above the line of the Corporation's conduit, but before the pipes were laid. He took all his gauges as close as he could to the new conduit, and in all cases reckoned a day of 24 hours. Other streams were running 5295, 2808, 860, and 1019 gallons per day respectively. Thorn Clough gave out 6672 gallons daily on its west branch, and 95,494 gallons on its east branch. Eight tributaries to a stream called Fall Clough contributed 85,163 gallons. Tarnsyke Clough ran at the rate of 37,732 gallons per day. None of this water went into the conduit. Thrush Clough gave 55,004 gallons, and the next stream to the east 42,343 gallons. A number of streams, tributary to the Tarnbrook Wyre, gave 43,227 gallons, and the river itself 810,204 gallons. The whole of the water supply, apart from the river, was 544,635 gallons, and with the river it made a total of 1,354,839 gallons daily. He gauged all the streams that he found close to the new line of pipes, and they took their rise above the pipes.

This concluded the case for the plaintiff.

Mr. WEBSTER, in opening the case for the Corporation, said his witnesses would prove that after all the required water had been abstracted, there would be 30 per cent. left, and this would find its way down below the conduits of the Corporation. This statement was, he said, to a great extent borne out by the last witness examined on behalf of Mr. Garnett. He then called

Mr. *Thomas Gow*, an estate agent and valuer, who stated that he had examined the plaintiff's moor in May and October last. In May it was exceptionally abundantly watered. In October he considered the quantity of water passing the conduits of the Corporation was quite sufficient for grazing, grouse-breeding, or agricultural purposes. He should deal with the easement *per se*, at the usual price of 1d. per yard, but as there would be exceptional damage for 10 or 12 weeks in the breeding and also in the shooting season, it might be necessary to have an extra keeper on the ground. He took 8750 lineal yards, at 1d. a yard at 25 years purchase, and it came to £911 9s. 2d. He allowed for the extra keeper £480, calculating the cost at 20 years, or £24 a year. His next item was interference with sporting rights during construction, £50. This made £1491 9s. 2d., which he believed to be a fair compensation. He did not consider the moor was injured at all for grazing purposes.

Mr. *R. J. Dent*, a land agent, said he had been three times over Mr. Garnett's land, and never saw so many springs on a similar space of ground. There was a superabundance of water. His estimate of the compensation to which Mr. Garnett was entitled was—6160 yards of piping, parallel to the old piping, at 1½d. a yard, £38 10s. per annum; 2590 yards of new ground, at 2d. a yard, £21 11s. 8d.; making a total of £60 1s. 8d. This at 25 years purchase gave £1502 1s. 8d., to which he added £40 for injury to the fishing, and £50 for extra disturbance, which brought his total estimate to £1592 1s. 8d.

On Thursday, the 18th, the proceedings commenced with the cross-examination of Mr. *Dent*, who quoted several cases of other moors in support of his figures in reference to the value of Mr. Garnett's estate.

Mr. *J. Mansergh*, C.E., was the next witness. He said he was engaged in connection with the Lancaster Water Act of 1851, and in the work preliminary to the Act of 1876 he again advised them, and had been in all the work from that time down to the present. He described the various works on Mr. Garnett's land, adding that the total area of actual occupation by works under the Corporation Act of 1876 was 167 square yards. The only area that was injured was 167 square yards. In his opinion the estimates previously given to the Corporation were sufficient to include any sporting rights Mr. Garnett might have, as the water-works were not such as materially to interfere with the value of the moor either for agricultural or sporting purposes. Section 19 of the 1876 Act bound the Corporation to leave sufficient water for agricultural purposes, and he had always been of opinion that when they left sufficient for agricultural purposes it would be sufficient for grouse. During the present year the rainfall had been below the average. He had gauged the springs on the 19th of October last, when the rainfall was very slight. The result showed that the yield from the 2700 acres of land above the pipe of the Corporation was 1,520,000 gallons, besides 360,000 passing over Tarnbrook Wyre, making together 1,880,000 gallons, which was all the Corporation could have taken on that day. The quantity left running down the stream was in all 441,404 gallons. This would bring the yield of the 2700 acres up to 2,321,400 gallons. In the case of a hot summer following a slight winter rainfall—which might be the case about once in a dozen years—he calculated the yield would be reduced from 1,880,000 to 1,100,000 gallons, and the quantity left might be reduced from 441,404 gallons to 258,658 gallons. In his opinion the 2700 acres did not represent the real area of the watershed; he should be inclined to put it at 3477 acres.

Mr. *J. Addie* said he had had the management of moorland farms in Lancashire, Yorkshire, and Westmoreland, and was now engaged by the Manchester Corporation in connection with their Thirlmere scheme. He considered the works of the Lancaster Corporation would improve Mr. Garnett's moor for the purposes of pasturage, and would not deteriorate it for grouse-breeding. He estimated the letting value at 6d. an acre, and considered that £729 3s. 4d. would be ample compensation for the easement of 8750 yards at 1d. per yard at 20 years purchase.

The first evidence taken on the following day was that of Mr. *T. Fenwick*, C.E., of Leeds, who said that, in conjunction with Mr. Mansergh, he had been over the whole line of pipe on Mr. Garnett's estate, and had inspected and gauged the springs and streams. He was certain that Mr. Mansergh was very much below the mark in his estimate of the quantity of water that would be left by the Corporation after they had taken what they required, and he considered, in fact, that the moor would be improved by a large portion of the water now upon it being drained off. In his opinion Mr. Garnett ought to be quite satisfied if he received £1193 as compensation.

Mr. *J. Newton*, C.E., said his valuation of the easement of the 8750 lineal yards of pipes on the estate was, at 1s. 8d. a yard, £729 3s. 4d.; then he allowed 20 per cent. for compulsory purchase, £145 16s. 8d.; making a total of £875. There would be some disturbance of the game, and there would be a right of passage, and consequent interference with the property, and this he had included in the 1s. 8d., by far the greater portion of which amount was for disturbance—about 1s. 6d. for disturbance, and 2d. for wayleave.

Mr. *G. Drewry*, agent for the Duke of Devonshire's Lancashire and Yorkshire estates and for Lord Chesham's estates, said he had visited Mr. Garnett's moor three times, and did not think it would be injuriously affected, as far as grouse were concerned, by the works done under the Corporation's Act of 1876. The water he saw there was a good deal more than enough for grouse. His estimate of the value of the easement was £1093 15s. for the pipes; £50 for disturbance during the progress of the works; and £600 for an extra keeper six months during the year for 20 years—total, £1743 15s. He should estimate the moor to be worth £150 a year for letting.

This concluded the case for the Corporation.

On Saturday, the 20th, the proceedings were resumed by Mr. WEBSTER addressing the Arbitrator on behalf of the Corporation. He said that the issue involved was a very large one, and of great pecuniary importance, and the view he had to submit was that the most moderate claim that had been put forward on behalf of Mr. Garnett could

only be supported by disregarding the facts of the case. The first introduction of the Lancaster Corporation on to the estate of Mr. Garnett was in 1864, when Mr. Garnett was compensated for the intrusion, and he (Mr. Webster) submitted that it would require strong evidence to make the Arbitrator treat the matter differently now from what it was treated then. The first question was the letting value of the grouse moors as they now stood, and it had been proved that Mr. Garnett, jointly with another, leased an adjoining moor for about 9d. per acre, and when sporting rights became assessable, the Assessment Committee of the Corporation sought to assess Mr. Garnett's lands at 6d. per acre on the whole. But he resisted this, and finally the assessment was made at 3d. per acre on moor and fell, 1s. 6d. on the woodlands, and 6d. on the ordinary enclosed lands. The learned Counsel pointed out that Mr. Statter, one of the principal witnesses for Mr. Garnett, had estimated the north moor as worth £500 a year, and the two moors at £1000 a year. This was Mr. Statter's valuation of the right of shooting grouse over 800 or 900 acres, of which barely a quarter would be affected in any way whatever by the works of the Corporation. Would it not be monstrous, he asked, to tax the ratepayers of Lancaster on such an estimate, when it was shown in evidence by the plaintiff's own witnesses that one of the choicest grouse moors in Perthshire, of 8000 acres, including a residence, was let for £400 a year? The evidence on the other side was that for moors over which three times as many grouse per acre were shot as over Mr. Garnett's estate, the price was 1s. an acre. Reverting to the question of the watershed, the learned Counsel pointed out that when the springs were gauged last October, after an unusual period of drought, the yield of water was found to be six times what it was estimated it ought to be from such an area. Some of Mr. Garnett's witnesses had said that in dry times there would not be a drop of water left in the streams, and that the Corporation would not be able to draw from this watershed anything like the quantity of water they required. But the Corporation were bound by the 19th section of their Act to leave at least enough water for agricultural purposes; and Mr. Statter had admitted that if there was enough left for those purposes there would be enough left for the grouse. As a matter of fact, the gaugings taken by Mr. Mansergh in a very dry season showed that even at such a time there would be more than ten times as much water left as the grouse would require. He submitted that £1000 would be ample compensation for Mr. Garnett, and, in conclusion, asked the Arbitrator not to saddle the Corporation with the costs of the application to revoke the submission to the former Arbitrator, Mr. J. F. Bateman.

Mr. Higgin pointed out that the Lord Chief Justice said it would be impossible for an award to have given the satisfaction which was given by an Arbitrator who had made such preliminary remarks as those used by Mr. Bateman. With reference to the facts of the case, the learned Counsel said the Corporation had power to sell water in bulk at any price, and they would no doubt make the most they could of it for the benefit of the ratepayers. Mr. Garnett's estate was a perpetual reservoir for these waterworks, and created by what would have been a trespass if it had not been for the Act of Parliament. They intended to store the water at Damasgill, and, therefore, it must be assumed they were going to take their maximum quantity; and Mr. Mansergh, their Engineer, had himself shown that in dry seasons there would be a deficiency. A comparison had been made of the grouse-yielding powers of this moor with moors in other places; but it must be remembered that Mr. Garnett, being himself the owner, never shot over them as a tenant would do. Even the witnesses on the other side agreed that this was an exceedingly good moor.

This concluded the proceedings. The award will be made on a future day.

It may be of interest to quote here, as showing the great diversity of opinion which exists among professional witnesses, the various estimates as to the amount of compensation to which Mr. Garnett is entitled. When the case was before Mr. Bateman, the Corporation witnesses assessed the amount as follows:—Mr. J. Mansergh, C.E., £738 16s. 8d.; Mr. J. Newton, C.E., £875; Mr. T. Bennett, C.E., 1093 15s. At the present hearing the following figures have been given:—Mr. Garnett's witnesses: Mr. Matthews, C.E., £19,800; Mr. T. Statter, £23,274; Mr. G. Storey, £23,274; Mr. J. Farrar, C.E., £16,035; Mr. J. Jackson, C.E., £16,035. Corporation witnesses: Mr. T. Gow, £1491 9s. 2d.; Mr. R. J. Dent, £1592 1s. 8d.; Mr. Addie, £732.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

So far as Manchester and the immediately surrounding district is concerned, a general advance in prices has been carried out to the extent of 10d. per ton on best coal, and 5d. on other descriptions of fuel except burgy; but this upward movement has only been followed out partially in other districts. The general tone of the market is, however, towards more firmness, and any present hesitation in making further material advance in prices is due chiefly to the exceptional mildness of the weather, which has, of course, temporarily affected the requirements for general consumption, and it is not improbable that an upward movement in prices may be carried out during the month, especially as the wages agitation now going on will almost compel colliery proprietors to take some such course. The better classes of round coal are moving off pretty freely for the time of the year, although there is no actual pressure in the market. A good deal of gas coal is also going away on account of contracts, but there is not much new business offering. Other classes of fuel are in moderate demand, and the pits are kept going about full time generally. The average prices at the pit's mouth are about as under:—Best Wigan Arley, 9s. to 9s. 6d.; Pemberton four-feet and lower qualities of Arley for house-fire and gas-making purposes, 7s. to 7s. 6d.; common Wigan mines, 6s. to 6s. 6d.; steam and forge coals, 5s. 6d. to 6s.; burgy, 4s. to 4s. 6d.; and good slack, 3s. to 3s. 6d. per ton.

There is a moderate inquiry for shipment, but for shipping orders colliery proprietors have to take lower prices than are obtainable for inland sales; steam coal delivered at Liverpool and Garston being still offered at from 6s. 9d. to 7s. 3d. per ton.

For the last few days there has been rather a falling-off in the amount of business doing in the iron trade of this district, but local makers of pig iron, having sold pretty largely during the last two or three weeks, show very little anxiety to press for further orders at present. A considerable weight of iron has been going into the hands of consumers in the district for delivery over the next three or four months, and prices for Lancashire pig iron are now firm at 46s. 6d. for No. 4 forge, and 47s. 6d. for No. 3 foundry, less 2½ per cent., delivered equal to Manchester. There has been only a dull demand for manufactured iron, and for local bars delivered into the Manchester district the average price is about £5 15s. per ton.

## NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade generally continues good, recent advances being fully sustained. Although the rise is not completely general, it is sufficiently extended to be considered established, and no doubt before long, if the demand continues, those coals which have not hitherto been able to secure better figures will now do so. The necessity for replenishing stocks, and the delays which the inclement weather has caused to tonnage on the way either to load or discharge coal cargoes, have contributed to the advance, and there are those who maintain that we shall see a continuance of the improvement throughout the year of which the commencement is so near at hand. An additional 1s. per ton will do no harm, except to those who may have speculated at low prices. The Royal Mail Company's yearly contracts have been arranged. There was no open competition, but it is considered that the figures are, if anything, a little better than those which were given twelve months since. Patent fuel, both at Cardiff and Swansea, continues in good demand.

The tin-plate trade is generally in a languid state, but the New Western Mill for the manufacture of tin bars at Cwmavon has re-started, and the men are again at full work. The proprietor has spent over £10,000 on this additional branch of business, and contemplates the erection of black-plate mills, to be followed by the manufacture of tin-plates.

## THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The improvement in the local coal trade continues, and, on the whole, the business transactions of the past week have been of a satisfactory character. Orders are more plentiful, and of a better class. Owing to the issuing of orders for winter stocks, a fair number of the collieries are well employed, and the order books are tolerably full. The masters are making fewer complaints, and the operatives have a prospect of a fair season's work, though the working scale is considered to be unevenly regulated. At the Wolverhampton market on Wednesday last Cannock Chase proprietors made quotations of from, 10s. to 11s. per ton for deep, and 8s. 6d. for shallow at the pit's mouth, which is a further rise of 1s. per ton, making for the past month an increase of 2s. on deep and 6d. on shallow; the standard rates now being 1s. per ton over those of the corresponding period of last year. The proprietors of the Bilston Colliery now have, by the amalgamation of that district with the Tipton, a prospect of renewing operations, as the work of pumping from those pits will be shortly commenced under the mines drainage scheme. As nearly the whole of the pits in the Bilston district have been idle so long, owing to their waterlogged condition, a step has doubtless been made in the right direction. The Tipton colliery owners are, however, expressing dissatisfaction.

The iron trade is more animated, and smelters are hopeful of the future. The demand is steadily improving, and the markets are more numerously attended. Quotations are, in the main, unchanged for the past two weeks, though the finished iron makers are, if anything, firmer, in so far as best bars are concerned. Bars of second quality, as also sheets, plates, strip, and hoop iron, are more inquired for. Makers of pig are reported to have a fair stock of orders in hand. In this branch, there is a better call both for all-mine and part-mine, and cinder qualities are realizing the full quoted rates. Although the American market is dull, there are a good average number of lines to hand for the Colonies. Ironstone and other minerals are selling better. Makers of heavy iron-foundry productions are steadily employed, and tube makers, galvanizers, and engineers are reporting an improvement on the month.

## YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There has of late been a falling-off with respect to the demand for steam coal, owing to the closing of the Baltic ports; but, on the whole, many of the leading thick-seam pits are forwarding about average supplies to Hull, Goole, and Grimbsy. A good deal of interest has, during the past week, been attached to the tenders for the supply of steam and locomotive coal for the North-Eastern Railway Company, and which close on Thursday. Colliery owners are competing for the order for supplying the Company during the ensuing year, and a meeting of the South Yorkshire Steam Coal Owners Association has been held to fix the prices.

At several of the collieries in the Barnsley, Sheffield, and Rotherham districts the raising of gas coal ranks amongst the leading features of the trade. A good tonnage is being raised and sent to various parts of Lincolnshire, as well as to the Eastern Counties. Supplies are for the most part forwarded on account of contracts entered into during the early part of the year.

Small coal suitable for engine purposes is not over good to get rid of, although prices are low. There is, however, a very large consumption going on in connection with coke-making, which was scarcely ever so largely followed as at the present time. As might be expected, business is not so active as it was a short time ago, whilst prices are rather lower. North Lincolnshire smelters draw largely from South Yorkshire, and send in return a good tonnage of ironstone for the use of the Yorkshire furnaces.

Great interest is just now being taken by both masters and men in the Employers Liability Act, which comes into operation on the 1st of next month. All the secretaries of the various Yorkshire miners associations are urging the men not to contract out of the Act, which they hold was destined to serve something more than a mere money consideration. The men are, however, largely interested in the West Yorkshire Miners Permanent Relief-Fund, which has over 9000 members, and is largely supported by the owners paying compensation, and steps are likely to be taken by that Society for the purpose of testing the feeling of the men on the question.

The iron trade, taken as a whole, is only quiet. One of the most prosperous branches connected with the trade is that relating to the make of pig iron, which is now largely carried on in various parts of both South and West Yorkshire. Merchant iron and rolled material is not over largely produced. The foundries continue slack, and several are in the market for sale.

## THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The Durham gas collieries are very busy. The shipments of coals and coke from the Tyne Dock over the past fortnight have been the largest of two weeks over a period of 20 years. The heaviest shipments have been gas coals, the price of which is unchanged. The contracts which will be made between this time and the end of January it is in every way probable will be at about the same figures as have run over the year—between 6s. and 7s. per ton, according to quality. The coke trade with the iron districts in Durham, Northumberland, North Yorkshire, Cumberland, and North Lancashire, is steady; and there have also been considerable shipments of coke to Spain and the Mediterranean over the last fortnight of November, and the few days of December which have passed. Prices do not change; they keep at a moderate figure. Ordinary kinds of coal are in excellent demand. They are in a better position in the market than they have been over the past five winters. They have improved about 2s. a ton in value since September. Steam coals are doing a fairly good business for the season; and there is a regular demand for small and manufacturing coals for local consumption at the factories and

the ironworks. There is no glut, neither is there speculation in any of the markets.

There has been a better supply of coasting sailing tonnage in the northern coal ports over the last fortnight, and the requirements of the gas-works have been fully met. A large number of cargoes of gas coals reached the bye-ports last week from the Tyne, and the trade has fallen into its regular track again. Freights paid small sailing vessels to load gas coals for the South are about the same to all the Channel and Eastern Counties ports. The freight paid steamers to carry coals to the London market is 4s. 6d. per ton. This is the regular figure at present. An improvement is noted in the shipment of gas coals to the North of France, and to the Italian ports of the Mediterranean. Steamers and sailing ships were also engaged last week on the Tyne to load cargoes of coals for the Irish gas-works; in fact, shipping business was very active all last week. There was a considerable supply of tonnage in the Tyne Dock put in turn to load gas coals coastwise. There have been considerable shipments of goods oversea.

The fire-brick and fire-clay retort business generally is dull, and most large concerns are adding to stock. The chemical markets, not only in the North but in Lancashire, are very flat. Prices do not improve, but, low as they are, in some instances they are less than they were a month ago. Stocks, fortunately, are kept down. The ironfoundries and rolling mills in the North of England are fully employed. There is a good deal of gas plant in the course of manufacture at Gateshead and Birtley.

THE PROPOSED AMALGAMATION OF THE BRIGHTON GAS COMPANIES.—The General Purposes Committee of the Brighton Town Council have resolved to oppose the intended application to Parliament of the Brighton and Hove Gas Company, for powers to purchase by agreement the undertakings of the Brighton Gaslight and Coke Company, and the Aldrington, Hove, and Brighton Gas Company.

THE WATER SUPPLY OF PEMBROKE.—A meeting of the Pembroke Town Council was held on the 25th ult.—the Mayor (Alderman George) in the chair—for the purpose of considering the question of providing water-works for the borough. Arrangements had, it was stated, some time since been made by a private gentleman to form a Company for carrying out a water-supply scheme, but without success. After a lengthy discussion, a resolution was passed that the Council should take the matter into their own hands, and ascertain the best way to provide the borough with water (a competent Engineer being engaged to ascertain where water could be obtained), and then make application to the Local Government Board for the money required to carry out the necessary works.

THE SHEFFIELD WATER COMPANY AND THE BATHS QUESTION.—In reference to the statement contained in a paragraph in the last number of the JOURNAL, given on the authority of the *Sheffield Independent*, that an appeal would be made by the Water Consumers Defence Association against the decision of the Master of the Rolls in regard to the supply of water to baths, the same authority now says that the wisdom of prosecuting an appeal by no means commends itself to all the subscribers to the Bingham defence-fund, some of whom would prefer to take advantage of the possibilities opened up by clause 3 of the parliamentary notice issued by the Company for a Bill next session, rather than fight the battle in the law courts. Under this clause the Company ask for power to supply water by agreement for all or any of the purposes mentioned in section 81 of the Sheffield Water-Works Act, 1853; but should the appeal go on, this clause might perchance not be inserted in the Bill. It has been reported that the Company were collecting the bath rates under the authority of the late decision; but it appears that there is no truth in the report.

# Register of Patents.

## APPLICATIONS FOR LETTERS PATENT.

4938.—WYMAN, W., Southgate Street, Gloucester, "A gas-stove for heating and ventilating purposes." Nov. 27, 1880.

4944.—SMITH, S., Croydon, Surrey, "Improvements in gas-stoves or heating apparatus." Nov. 27, 1880.

4998.—SYMES, W. J. B., Stepney, London, "Improvements in apparatus for the manufacture and purification of gas." Dec. 1, 1880.

5014.—SWAN, J. W., Newcastle-upon-Tyne, "Improvements in and connected with electric lamps." Dec. 2, 1880.

5024.—HORNE, E. W., and TWEEDALE, E. and S., Accrington, Lancs, "Improvements in gas-engines." Dec. 2, 1880.

## PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2260.—MONK, W. W., Bournemouth, Hampshire, "Improvements in apparatus used in the manufacture of gas." June 3, 1880.

2265.—WILLIAMS, M., Wigan, Lancs, "Improvements in methods of and apparatus for increasing the illuminating power of gas-flames." June 3, 1880.

2288.—ROBBINS, J., Uxbridge Road, London, "An improved joint for water and other pipes." June 5, 1880.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Dec. 1, 1880.

| Company. | District. | Illuminating Power. (In Standard Sperm Candles.) | | | Sulphur. (Grains in 100 Cubic Feet of Gas.) | | | Ammonia. (Grains in 100 Cubic Feet of Gas.) | | | Sulphuretted Hydrogen. | Pressure. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Max. | Min. | Mean. | Max. | Min. | Mean. | Max. | Min. | Mean. | | |
| The Gaslight and Coke Company | Notting Hill | 17·9 | 17·0 | 17·4 | 11·7 | 9·3 | 10·7 | 0·2 | 0·1 | 0·1 | None. | In excess. |
| | Camden Town | 17·2 | 16·4 | 16·9 | 20·8 | 15·8 | 17·6 | 0·0 | 0·0 | 0·0 | " | " |
| | Dalston | 17·3 | 16·8 | 17·0 | 14·4 | 11·5 | 13·2 | 0·4 | 0·0 | 0·1 | " | " |
| | Bow | 17·1 | 16·6 | 16·9 | 14·7 | 11·3 | 13·1 | 0·2 | 0·0 | 0·1 | " | " |
| | Chelsea | 17·0 | 16·5 | 16·7 | 19·7 | 14·8 | 16·9 | 0·2 | 0·0 | 0·1 | " | " |
| | Kingsland Road | 17·2 | 16·5 | 16·9 | 14·8 | 9·4 | 13·1 | 0·1 | 0·0 | 0·0 | " | " |
| | Westminster (cannel gas) | 21·5 | 20·4 | 20·9 | 21·3 | 15·8 | 18·7 | 0·0 | 0·0 | 0·0 | " | " |
| South Metropolitan Gas Company | Peckham | 16·9 | 16·6 | 16·8 | 14·2 | 9·3 | 11·7 | 0·5 | 0·0 | 0·3 | " | " |
| Commercial Gas Company | Old Ford | 18·1 | 16·9 | 17·5 | 16·5 | 14·0 | 15·4 | 0·2 | 0·1 | 0·1 | " | " |
| | St. George-in-the-East | 17·6 | 16·2 | 17·1 | 18·3 | 7·3 | 11·9 | 0·1 | 0·0 | 0·0 | " | " |

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

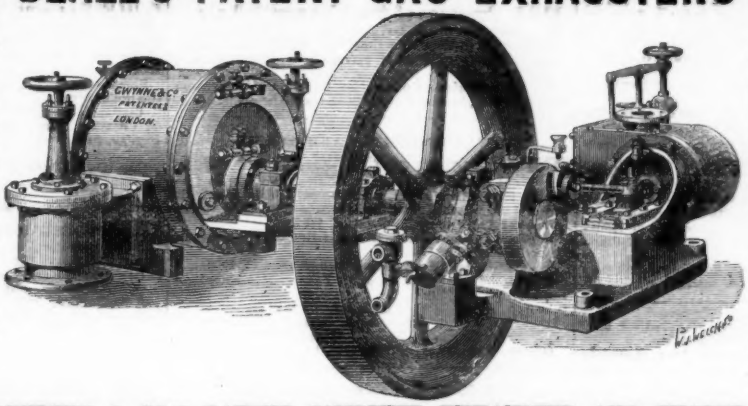
*Note.*—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

# Share List of Gas and Water Companies.

| Number of Shares issued. | Amount per Share. | Name. | Amount paid up per Share. | Last Divd. p.Cent. p. Ann. | Latest Quotations. | Number of Shares issued. | Amount per Share. | Name. | Amount paid up per Share. | Last Divd. p.Cent. p. Ann. | Latest Quotations. | Number of Shares issued. | Amount per Share. | Name. | Amount paid up per Share. | Last Divd. p.Cent. p. Ann. | Latest Quotations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | £ | GAS COMPANIES. | £ s. d | £ s. d | £ | | £ | GAS COMPANIES. | £ s. d | £ s. d | £ | | £ | GAS COMPANIES. | £ s. d | £ s. d | £ |
| 589944 | 10 | Alliance and Dublin | 10 0 0 | 10 0 0 | 17—17½ | 6200 | 5 | Georgetown, Guiana | 5 0 0 | 7 0 0 | 4¼—4¾ | 500000*l.* | Sk. | South Metropoltn. | 100 0 0 | 11 15 0 | 203—208 |
| 10000 | 20 | Angio-Romano . . | 20 0 0 | 10 0 0 | 21—23 | 300000 | 100 | Glasgow Corporation Gas | 100 0 0 | 9 0 0 | 205—210 | 1305000 | Sk. | Do., "B" | 100 0 0 | | 180—185 |
| 5000 | 20 | Bahia (Limited). . | 20 0 0 | 5 0 0 | 16—17 | | | | 100 0 0 | 6 15 0 | 155—160 | 12000 | 5 | Tottenham & Edmonton | 5 0 0 | 10 0 0 | 9—10 |
| 1000 | 20 | Do., 1st pref. . . | 20 0 0 | 10 0 0 | 25—27 | 115000 | 100 | Do., do. | 100 0 0 | | 186—190 | 2864 | 10 | Do. | 6 0 0 | 7 0 0 | .. |
| 1500 | 20 | Do., 2nd pref. . . | 20 0 0 | 7 10 0 | 20—22 | .. | 100 | Grimsby Gas, A. . | 100 0 0 | .. | 15—16 | 1500 | 10 | Wandsw. & Putney | 10 0 0 | 10 0 0 | 14½—15 |
| 40000 | 5 | Bombay (Limited). | 5 0 0 | 7 10 0 | 5⅞—6¼ | .. | 10 | Hampton Court . . | 10 0 0 | 10 0 0 | 15—16 | 1500 | 10 | Do. | 10 0 0 | 7 10 0 | 12½—13½ |
| 10000 | 5 | Do., fourth issue. | 4 0 0 | 7 0 0 | ½—1 pm. | 7000 | 10 | Hong Kong (Lim.) | 10 0 0 | 10 0 0 | 15—16 | 1500 | 10 | Do. | 10 0 0 | 7 0 0 | 11½—12 |
| 10000 | 10 | Bournemouth . . | 10 0 0 | 8 0 0 | 13½—14½ | 5000 | 10 | Hornsey | 10 0 0 | 10 0 0 | 15—16 | 4000 | 10 | Do. | 10 0 0 | 7 0 0 | 11½—12 |
| 229700 | .. | Brentford | 100 0 0 | 9 0 0 | 152—156 | 20000000*l.* | 100 | Imperl. Continental | 100 0 0 | 10p.c.& 2 p.c. | 187 90xd bonus | 26000 | 5 | West Ham | 5 0 0 | 10 0 0 | 8½—9½ |
| .. | .. | Do., 5 per ct. pref. | 100 0 0 | 5 0 0 | 95—100 | | | | | | | .. | 10 | West Kent | 10 0 0 | 10 0 0 | 14—16 |
| .. | 20 | Do., D shares . . | 18 0 0 | 9 0 0 | 6—8 pm. | .. | .. | Kingston | .. | .. | .. | 2400 | 5 | Woolwich, Plmstd. and Charlton . . | 5 0 | 16 0 0 | 9—10 |
| 5400 | 20 | Brighton | 20 0 0 | 10 0 0 | 36—38 | .. | .. | Lea Bridge | .. | 7 0 0 | 11½—12½ | | | | | | |
| 5000 | 20 | Brighton and Hove | 20 0 0 | 10 0 0 | 34—36 | 56100*l.* | 100 | Liverpool United . | 100 0 0 | 10 0 0 | 185—190 | | | | | | |
| 14000 | 20 | British (Limited) . | 20 0 0 | 10 0 0 | 33—35 | 169100*l.* | 100 | Do., B | 100 0 0 | 7 0 0 | 125—135 | | | | | | |
| 7282 | 20 | Cagliari (Limited). | 20 0 0 | 8 0 0 | 19 | 3865000*l.* | Sk. | London | 100 0 0 | 10 0 0 | 180—185 | | | | | | |
| 1500 | 10 | Colney Hatch . . . | 10 0 0 | 5 0 0 | 9—11 | 150000*l.* | Sk. | Do., 1st pref. . . | 100 0 0 | 6 0 0 | 127—132 | | | | | | |
| 5500000*l.* | Sk. | Commercial . . . . | 100 0 0 | 11 5 0 | 188—193 | 7622 | 25 | Do., A shares . . | 25 0 0 | 6 0 0 | 31—33 | | | | | | |
| 700000*l.* | Sk. | Do., 7 per cent. . | 100 0 0 | 8 5 0 | 137—142 | 266927. | Sk. | Do., Debenture stock | 100 0 0 | 5*l.* & 6*l.* | .. | | | | | | |
| 20000 | 20 | Continental Union. | 20 0 0 | 6 10 0 | 21½—22 | | | | | | | | | | | | |
| 20000 | 20 | Do., new | 14 0 0 | 6 10 0 | par. 1pm | 15000 | 5 | Malta and Mediterranean (Limited). | 5 0 0 | 3 0 0 | 2¼—2⅝ | | | | | | |
| 10000 | 20 | Do., preference . | 20 0 0 | 7 0 0 | 24½—25½ | | | | | | | | | | | | |
| 750000*l.* | Sk. | Crystal Palace District | 100 0 0 | 10 0 0 | 172—177 | 6000 | 5 | Do., preference . | 5 0 0 | 7 10 0 | 5—5⅛ | | | WATER COMPANIES. | | | |
| 1250000*l.* | Sk. | Do., 7 per cent. . | 100 0 0 | 7 0 0 | 128—132 | 25000 | 5 | Mauritius (Limited) | 2 5 0 | 1 0 0 | 1⅜—1½ dis | | | | | | |
| 500000*l.* | Sk. | Do., preference . | 100 0 0 | 6 0 0 | 119—123 | 8000 | 20 | Monte Video (Lim.) | 20 0 0 | 6 0 0 | 16½—17¼ | 615600 | 100 | Chelsea | 100 0 0 | 6 10 0 | 209—214 |
| 25000 | 6 | Do., ordin. 7 p. c. | 1 4 0 | 7 0 0 | ⅜—1 pm. | | | Nictheroy, Brazil (Limited) | 10 0 0 | 5 0 0 | 5—6 | 1624700 | 100 | East London | 100 0 0 | 6 10 0 | 210—215 |
| 7100 | 25 | Edinburgh | 25 0 0 | 10 0 0 | 46—48 | 30000 | 5 | Oriental (Calcutta). | 5 0 0 | 9 0 0 | 7—7½ | 10798 | 50 | Grand Junction . | 50 0 0 | 5 0 0 | 115—120 |
| 23406 | 10 | European (Limited) | 10 0 0 | 10 10 0 | 19—20 | 30000 | 5 | Do., new shares . | 4 0 0 | 9 0 0 | 1¼—1⅜pm | 5840 | 25 | Do., ½ shares . . | 25 0 0 | 5 0 0 | 57—60 |
| 12000 | 10 | Do., new shares. | 7 10 0 | 10 10 0 | 6¾—7¼ | 10000 | 5 | Ottoman (Limited). | 5 0 0 | 3 0 0 | 2⅛—2⅜ | 6160 | 25 | Do., new ditto; max. div., 7½ p.c. | 25 0 0 | 5 0 0 | 40—45 |
| 35406 | 10 | Do., new shares . | 5 0 0 | 10 10 0 | 4—5 pm. | 10000 | 10 | Pará (Limited) . . | 10 0 0 | 5 0 0 | 6¼—6⅞ | 555180*l.* | 100 | Kent | 100 0 0 | 8 0 0 | 280—290 |
| 4096300*l.* | Sk. | Gaslight & Coke A. | 100 0 0 | 11 0 0 | 181—183 | 3000 | 10 | Richmond (Surrey) | 10 0 0 | 10 0 0 | 17—17½ | 781800*l.* | 100 | Lambeth | 100 0 0 | 6 10 0 | 208—213 |
| 1000000*l.* | Sk. | Do. B. | 100 0 0 | 4 0 0 | 75—78 | 3000 | 10 | Do., new | 10 0 0 | 9 0 0 | .. | 326150*l.* | 100 | Do., max., 7½ p.c. | 100 0 0 | 6 10 0 | 180—185 |
| 50000 | 10 | Do. do., 5th do. . | 10 0 0 | 5 0 0 | 17¼—17¾ | 87500 | 20 | Rio de Janeiro (Limited) | 20 0 0 | 10 0 0 | 24—26 | 442 | 100 | New River | 100 0 0 | 10 3 8 | 375—385 |
| 2000000*l.* | Sk. | Do. C 10 p.c. pref. | 100 0 0 | 10 0 0 | 217—222 | | | | | | | 4475 | 100 | Do. | 85 0 0 | 10 3 8 | 299—300 |
| 300000*l.* | ,, | Do. D do. do. . | 100 0 0 | 10 0 0 | 217—222 | 1500 | 32½ | Shanghai | 32 10 0 | 12 0 0 | .. | 400000 | 100 | Do., deb. sk., 4p.c. | 100 0 0 | 4 0 0 | 107—110 |
| 155000*l.* | ,, | Do. E do. do. . | 100 0 0 | 10 0 0 | 217—222 | 135000 | 100 | Sheffield, A | 100 0 0 | 10 0 0 | 197—198 | 666800*l.* | 100 | Southwrk & Vauxh. | 100 0 0 | 6 0 0 | 217—222 |
| 300000*l.* | ,, | Do. F 5 do. do. . | 100 0 0 | 5 0 0 | 108—111 | 99700 | 100 | Do., C | 100 0 0 | 10 0 0 | 195—197 | 3247000*l.* | 100 | Do., pref. stock . | 100 0 0 | 5 0 0 | 129—132 |
| 600000*l.* | ,, | Do. G 7½ do. do. . | 100 0 0 | 7 10 0 | 160—165 | 12500 | 5 | Singapore (Lim.) . | 5 0 0 | 7 10 0 | 5⅞—6¼ | 1265000*l.* | 100 | Do., D shares . . | 100 0 0 | 6 0 0 | 170—180 |
| 1300000*l.* | ,, | Do. H | 100 0 0 | 7 0 0 | 136—139 | 2000 | 5 | Do., preference . | 5 0 0 | 7 10 0 | 5⅞—6¼ | 15073 | 61 | West Middlesex . | 61 0 0 | 6*l.* p.sh. | 172—177 x new |

# GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.




**GWYNNE & CO.**

Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is —*"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."*

**GWYNNE & CO.'S PATENT COMBINED EXHAUSTER AND ENGINE.**

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

**Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.**

**PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers,**
**ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

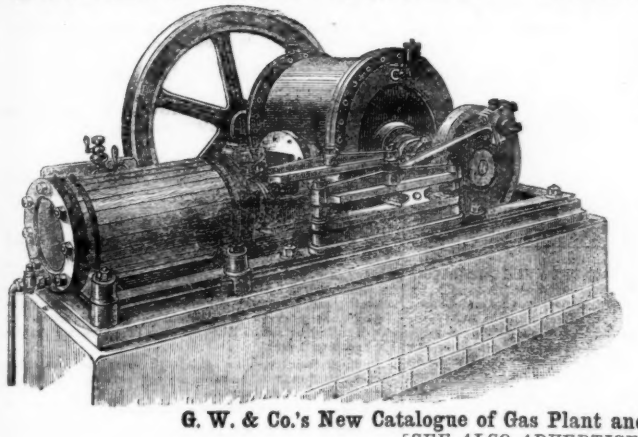
*Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.*

# BEALE'S IMPROVED PATENT GAS EXHAUSTERS,

WITH

**Wrought-Iron Spindles and**

# ENGINES COMBINED.



SOLE MAKERS,

**GEORGE WALLER & CO.**

**MAKERS OF ENGINES, EXHAUSTERS,**
**INDEX AND DISC GAS-VALVES,**
**HYDRAULIC MAIN VALVES,**
**BYE-PASS VALVES,**
**TAR, LIQUOR, AND OTHER PUMPS,**
**SCRUBBERS AND PURIFIERS,**
**CONDENSERS, BOILERS, &c.**

**G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.**

[*SEE ALSO ADVERTISEMENT, PAGE* 910.]

**Phœnix Engineering Works:**

# HOLLAND STREET, SOUTHWARK, S.E.

**WANTED, Readers of a Pamphlet,** prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c.

Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

**WANTED, by a Young Man (married),** a Situation in a Gas-Works. Is the son of a Manager, and is a good Main and Service Layer. Can do any Fittings in the Retort-House; also can Fix and Read Indexes of Meters, and has had experience both at Lathe and Vice. Very steady.

Apply to the MANAGER, Gas-Works, Crayford, KENT.

**THE Advertiser, having had seven years** practical experience in the Manufacture and Distribution of Gas, and all matters connected therewith, including Main-Laying and Gas-Fittings, use of Test Apparatus, also Office Work and Collecting, desires a RE-ENGAGEMENT in any suitable capacity. Fair Draughtsman. Aged 25. Total abstainer. Excellent references.

Address No. 702, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO TAR DISTILLERS, &c.

**ADVERTISER is open for an Engage**ment as MANAGER of WORKS. Several years practical experience of the Distillation of Tar and the Manufacture of Sulphate of Ammonia. No objection to go abroad.

Address No. 703, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, at a Gas-Works making** about 200,000 a year, in the immediate neighbourhood of London, an experienced GENERAL FOREMAN, who thoroughly understands the Carbonizing and Purifying Departments.

Applicants must not be under 30 nor over 45 years of age.

Address No. 704, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED.—The Advertiser, a Young** Man, aged 39, married, is open for an Engagement as MANAGER and SECRETARY of a medium-sized Gas-Works, or SUB-MANAGER of a large Works. Has a thorough Knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 16 years. Highest testimonials and references.

Address No. 678, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, by the Newcastle-under-**Lyme Gas Company, a good, efficient, and steady GAS-FITTER. General good character indispensable.

Applications and references to be sent to the undersigned.

W. WINSTANLEY, Engineer and Manager.

TO COLLIERY PROPRIETORS.

**WANTED, to represent a good York-**shire or Derbyshire Colliery on the South-Western line. Salary, or commission and expenses.

Address SALESMAN, at Horncastle's Central Advertisement Offices, 61, CHEAPSIDE, E.C.

GAS-WORKS MANAGER.

**WANTED, a Sober and thoroughly** Practical WORKING MANAGER, for the Gas-Works, Barbadoes. Salary £200, with £25 per annum for lodging. An increase of salary to £250 will be made when the Directors are able to pay 2½ per cent., and £25 additional salary for each additional ½ per cent. paid.

First-class return tickets and half salary allowed during passage out and home.

Present make of gas about 5,500,000 feet annually.

A cash deposit of £200 with the Company, or £300 joint deposit will be required.

The Directors are prepared to offer an immediate engagement to the Manager selected.

Testimonials to be forwarded, prepaid, to the SECRETARY, Barbadoes Gas Company, Limited, 9, New Bartholomew Street, BIRMINGHAM.

TO PROFESSIONAL ENGINEERS.

**THE Waste Water Meter Company,** Limited, are prepared to receive APPLICATIONS for the Office of SECRETARY and GENERAL MANAGER (in Liverpool). Salary £250 per annum. Commission and liberty to take private practice after first year.

Apply, by letter (for form of application and particulars) to CHAIRMAN of the Waste Water Meter Company, Limited, 4, Cook Street, LIVERPOOL.

**THE Chester United Gas Company have** FOR SALE about 20 Tons of RETORT CARBON. Offers are requested, addressed to the undersigned.

FLETCHER W. STEVENSON, Engineer and Manager.

TAR FOR SALE.

**THE Directors of the Dronfield Gaslight** and Coke Company are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works for One year from Jan. 1, 1881.

Tenders, stating price per ton at the Works, or delivered in casks at Dronfield Railway Station, should be sent to the undersigned not later than the 1st prox.

The Directors do not bind themselves to accept the highest or any tender.

CHRISTOPHER THORPE, Secretary.

Chesterfield, Dec. 1, 1880.

**THE Redcar Gas Company having** discontinued their Marske Works, have FOR IMMEDIATE SALE Four Cast-Iron PURIFIERS 6 ft. diameter by 3 ft. deep, with strong Wrought-Iron Covers, Centre-Valve, &c. A 9-in. Cast-Iron PIPE CONDENSER, 21 Columns of Pipes 18 ft. high. About 120 ft. of 9-in. Wrought-Iron FOUL MAIN (nearly new). An 18-in. HYDRAULIC MAIN, RETORT-FITTINGS, &c.

The above are in very good condition, and are suitable for erection elsewhere.

Further particulars may be had on application to the undersigned,

M. FLIGG, Secretary.

AMMONIA PLANT FOR SALE.

**A COMPLETE Plant in thorough working order**, to make up to 1½ tons daily; or Saturator and Crystallizing Pans will be sold separately. Also Cornish and other Boilers, Tar Stills, Hydraulic Press, Iron Tanks, Tangye's Pumps, &c., for Sale, and Waterside Premises to be Let.

Apply to T. V. CLARKE, on the premises, Trundley Lane, Surrey Canal, DEPTFORD, S.E.

Mr. Clarke will contract for the Re-erection of the Tar and Ammonia Plant in any part of the country.

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**THE Gravesend and Milton Gas Company** have FOR SALE, Four 12 ft. square PURIFIERS, 4 ft. deep, with 12-in. Connections and eighteen 12-in. Donkin's VALVES, together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 8-in. GOVERNOR, by Sugg, of Westminster.

For further particulars apply to the undersigned.

S. SOWOOD, Manager.

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**THE Gloucester Gas Company have the** undermentioned APPARATUS for Sale:—

About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

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MALTA.

LIGHTING BY GAS VALLETTA, FLORIANA, MARSA, SENGLEA, COSPICUA, & VITTORISSA.

**SEALED Tenders will be received at** this Office until noon of Monday, June 3, 1881, for Lighting by Gas the Streets of Valletta, Floriana, Marsa, Senglea, Cospicua, and Vittorissa, for a period of Ten years, to date from May 15, 1882.

Tenders to be on the established printed form supplied by this Office.

The conditions of the contract and further particulars will be made known on application to this Office; and to the Office of the Crown Agents for the Colonies, Downing Street, London.

Each tender is to be accompanied with a deposit of £200, which sum is to be temporarily lodged with the Receiver-General, to be dealt with as stated hereunder; and no notice will be taken of any tender unless the due fulfilment of this condition be found endorsed thereon by that Officer.

The deposit thus made shall be forfeited in favour of Government should the party tendering, or the surety, fail to appear for the stipulation of the requisite contract in the event of the tender being accepted, within three days from the day of the notice given to him to that effect.

The deposits of the unsuccessful tenderers shall be returned to them immediately after notice will have been given to the party whose tender will have been accepted.

Any notarial fees will have to be paid by the Contractor.

The undersigned retains the power of accepting or rejecting all or any of the tenders received.

C. RAPINET,
Acting Auditor-General and
Director of Contracts.

Office of the Auditor-General and Director of Contracts, Valletta, Oct. 7, 1880.

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COLCHESTER GAS COMPANY.

**THE Directors of the Colchester Gas** Company are prepared to receive TENDERS from competent persons for the Construction of a Brick GAS-HOLDER-TANK in puddle, and other works in connection therewith.

The drawings and specification may be seen, and forms of tender obtained, on payment of one guinea (which will be returned if a *bonâ fide* tender be made), at the Offices of the Gas Company, Queen Street, Colchester, or of Mr. G. W. Stevenson, Engineer, 38, Parliament Street, Westminster; and sealed tenders, properly endorsed, must be delivered, addressed to J. B. Harvey, Esq., J.P. Chairman of Directors, at the Offices of the Company, on or before Friday, Dec. 17, 1880.

By order,
J. T. BROWNING, Manager.

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TO MANUFACTURERS, INVENTORS, AND PATENTEES.

**THE Trustees of the "Young" Chair of** Technical Chemistry, Anderson's College, Glasgow, have reserved in their New Building Five Private Laboratories for the especial use of persons who require isolation and privacy.

The Laboratories are under the direction of PROFESSOR MILLS, F.R.S., to whom application should be made.

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TO TAR DISTILLERS AND OTHERS.

**THE Directors of the Wirksworth Gas-**light and Coke Company, Limited, are prepared to receive TENDERS for the Purchase of their Surplus TAR and AMMONIACAL LIQUOR produced at their Works for One or Three years, from Jan. 1, 1881.

Particulars may be had on application to the Manager, at the Works, Wirksworth.

Tenders to be delivered on or before Dec. 14, 1880, and endorsed "Tender for Surplus Tar and Ammoniacal Liquor."

By order,
BENJAMIN S. JONES,
Manager and Secretary.

Offices, Warmbrook, Wirksworth, Derbyshire.

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TENDER FOR TAR AND LIQUOR.

**THE Directors of the Grantham Gas** and Coke Company are prepared to receive TENDERS for the Purchase of their AMMONIACAL LIQUOR and Surplus TAR, for One, Two, or Three years, from Jan. 1, 1881. The quantity of coal carbonized in Twelve months is about 4000 tons.

Tenders to be sent to the undersigned, not later than the 20th of December inst., endorsed "Tender for Tar, &c."

The Directors do not bind themselves to accept the lowest or any tender.

Any further information may be obtained on application to Mr. Barratt, Engineer and Manager.

Gas-Works, Grantham, Dec. 4, 1880.

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**CORPORATION OF LANCASTER—GAS AND WATER DEPARTMENT.**

TO GASHOLDER MAKERS.

**THE Gas and Water Committee are pre-**pared to receive TENDERS for the Construction and Erection of a Single-lift GASHOLDER, 130 ft. diameter by 30 ft. 6 in. deep, at their Works, St. Geo ge's Quay, Lancaster.

Plans and specifications may be seen or copies obtained at my Office, here, on and after Thursday, the 9th inst.

Sealed tenders, endorsed "Tender for Gasholder," must be sent in, under cover, addressed to T. Swainson, Esq., Town Clerk, Lancaster, not later than Tuesday, the 28th inst.

The Committee do not bind themselves to accept the lowest or any tender.

WM. FLEMING, Manager.

Gas-Works, Lancaster, Dec. 1, 1880.

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**THE Hindley Local Board are prepared** to receive OFFERS for One GASHOLDER, 50 ft. by 20 ft., with Six Pillars, Counterbalance-weights and Chains to each, wrought-iron Lattice Girders complete, with 8-in. Inlet and Outlet Connections; One Walker's Patent 8-in. Valve on outlet; One cast-iron Syphon Pump on inlet; 226 ft. of 8-in. Gas-Main Pipes, socket jointed. The whole of the best materials, by D. Howard and Son, West Bromwich; in use only six years.

Can be seen at Platt Bridge, Hindley.

Communications to be made to the undersigned.

By order,
STEPHEN HOLT, Clerk to the Board.

Offices, Cross Street, Hindley, Nov. 11, 1880.

---

BOROUGH OF OVER DARWEN—GAS AND WATER DEPARTMENT.

**THE Gas and Water Committee of the** above Corporation hereby invite TENDERS for the Supply of all the Cast-Iron MAINS required for Gas and Water purposes during a period of One year, from Jan. 1, 1881.

Specifications and forms of tender may be obtained from the undersigned.

Tenders, endorsed "Tender for Pipes," to be sent to C. Costeker, Esq., Town Clerk, Darwen, on or before Dec. 13, 1880.

THOS. DUXBURY, Manager.

Gas-Works, Darwen, Nov. 26, 1880.

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Just Published, 5s., cloth boards (postage 4d.),

**THE Construction of Gas-Works and the** Manufacture and Distribution of Coal Gas. By SAMUEL HUGHES, C.E. Sixth Edition. Re-written and enlarged by WILLIAM RICHARDS, C.E.

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**DESTRUCTIVE DISTILLATION: A** Manualette of the Paraffin, Coal Tar, Rosin, Oil, Petroleum, and kindred Industries. By EDMUND J. MILLS, D.Sc. (Lond.), F.R.S., "Young" Professor of Technical Chemistry in Anderson's College, Glasgow.

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On the Science and Practice of the Manufacture and Distribution of

## COAL GAS.

Edited by THOS. NEWBIGGING, C.E., M.Inst.C.E., and W. T. FEWTRELL, F.C.S.

Orders received by

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TO INVENTORS AND PATENTEES.

**MR. W. H. BENNETT, having had** considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

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# JAMES MILNE & SON,

## GAS ENGINEERS,

**Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,**

EDINBURGH, AND

## 2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

**STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,**

**And every description of Gas-Fittings and Gas Apparatus.**

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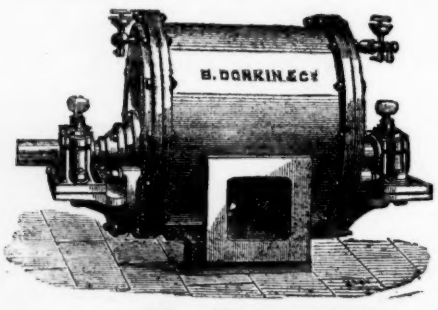


# NEW PATENT GAS-EXHAUSTERS.

## [J. BEALE'S.]

MESSRS. B. DONKIN & Co. possess the sole right to manufacture J. Beale's Exhausters under his new patent.

MADE WITH TWO OUTSIDE BEARINGS AND LATEST IMPROVEMENTS.

ALSO MANUFACTURERS OF

**IMPROVED GAS AND WATER VALVES, STEAM-ENGINES, &c., &c.**

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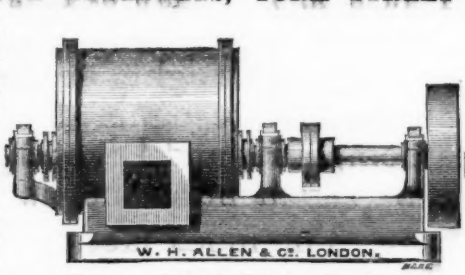
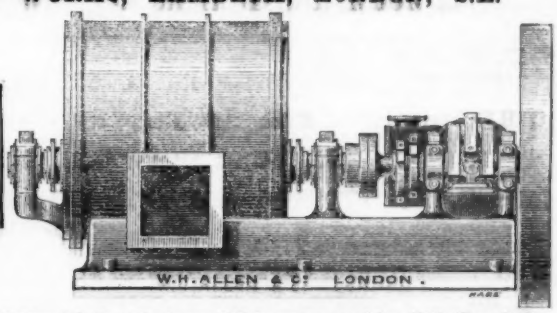
These Exhausters are made with the latest improvements, and are further fitted with a new segment of annealed cast iron, so contrived that the gas is not allowed to expand into the Drum, as in the old machine, and a considerable saving is thereby effected.




Exhauster driven by Belting. Complete on Bed-plate.




Combined Direct-Acting Engine and Exhauster, requiring little Foundation.

**Makers of GAS EXHAUSTING AND PUMPING MACHINERY.**

IMPROVED BEALE'S PATENT.

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FIRE-CLAY AND BRICK WORKS,

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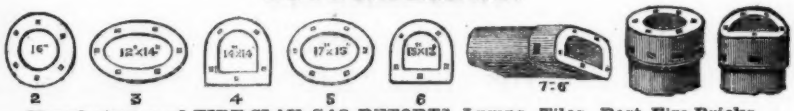


**Manufacturers of FIRE-CLAY GAS RETORTS, Lumps, Tiles, Best Fire-Bricks, and every requisite for Gas-Works.**

Large Stock of all Sizes of Retorts on Hand.

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FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

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ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

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No Cleaning. No Sweeping. No Smell.
No Fixing. No Attention. No Waste.
No Danger. No Dust. No Dirt.

For Studios. For Conservatories.
For Halls. For Schoolrooms
For Surgeries. For Waiting Rooms.

BURN FOR 12 HOURS WITH 5 POUNDS OF COAL.

**DOULTON & CO.,**
**Lambeth Pottery, London, S.E.**
May be had of the principal Ironmongers.

**MR. CORBET WOODALL, C.E.,**

Has Removed his Office to

PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

NOTICE OF REMOVAL.

THE OWNERS OF THE

**BIRTLEY IRON-WORKS**

AND

**PELAW MAIN COLLIERIES**

Have REMOVED their London OFFICES from No. 101, Cannon Street, to No. 46, Cannon Street.

Their Warehouse for Gas and Water Pipes and other Castings is at Scott's Wharf, Bankside, SOUTHWARK.

**GARSIDE'S IMPROVED MAIN** DRILLING CLIP.

No. 1 takes from 2-in. to 6-in. Mains.
No. 2 takes from 6-in. to 12-in. Mains.

GARSIDE'S REGISTERED TUBE-VICE takes ⅛ brass to a 2-in. Socket.

May be had direct from the maker, SAMUEL GARSIDE, Gatefield Iron-Works, ASHTON-UNDER-LYNE.

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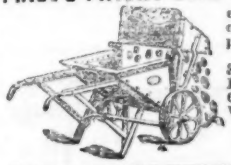

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

*Prices are Reduced.*

**S. PONTIFEX & CO.,**

**GAS AND WATER ENGINEERS,**

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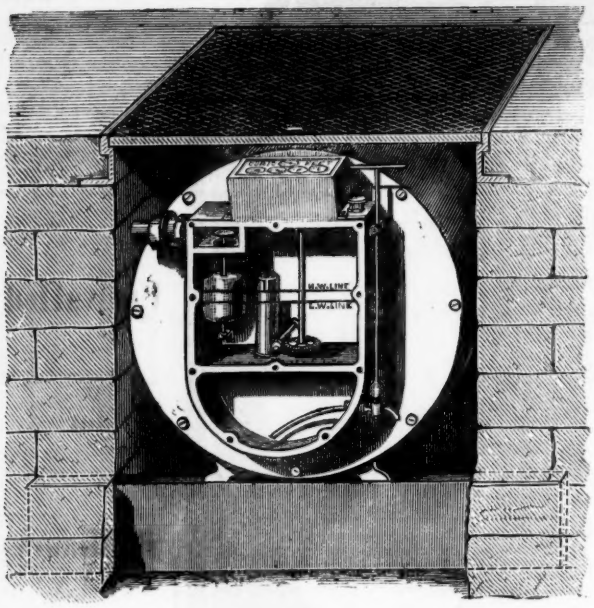
Supply and Erect Street Lamp Columns, together with Head Irons and Lanterns, as well as all the other fittings connected therewith.

S. P. & Co. also contract with Gas, Railway, and other Companies, Local Boards, and Vestries, for the maintenance and repair of Lamps and Fittings.

# IMPROVED STREET LIGHTING.

THE necessity for having large sized Gas Lights at street crossings and other open spaces is now generally recognized. To facilitate terms for their use between Gas Companies and Lighting Authorities, we have devised a simple meter arrangement as shown.



The index faces upwards.

The inlet at side and outlet at back may be altered as desired.

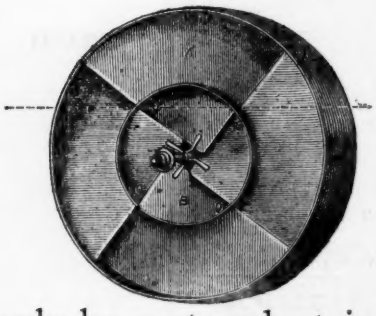
The rod with handle opens and closes the overflow tap.

The Meter case is of cast iron, and it is desirable to place it on a support 6 in. or 8 in. from bottom of tank, that it may be free from the effects of damp.

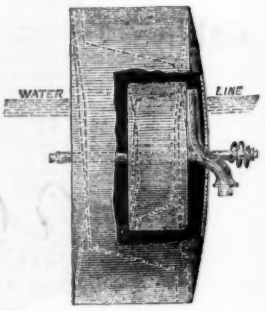
In frosty weather a little glycerine mixed with the water prevents freezing.

The Meter is fitted with

## WARNER & COWAN'S
## PATENT SELF-REGULATING DRUM,



which ensures correctness of registration within the water-lines shown on the illustration, while its long range of float prevents the valve being closed by vibration from traffic.




Frequent inspection is unnecessary, as the Meter need only be watered at intervals of nine to twelve months.

Dry Meters are unsuitable—the condensation which takes place inside Meters in so exposed a position interfering with their working.

Our arrangement has been in use for some time in several of the London parishes, and gives complete satisfaction.

They are made in all sizes up to 20 Lights.

PRICES AND DIMENSIONS ON APPLICATION TO

## W. & B. COWAN,

(ESTABLISHED 1827,)

## WET & DRY GAS-METER MANUFACTURERS,

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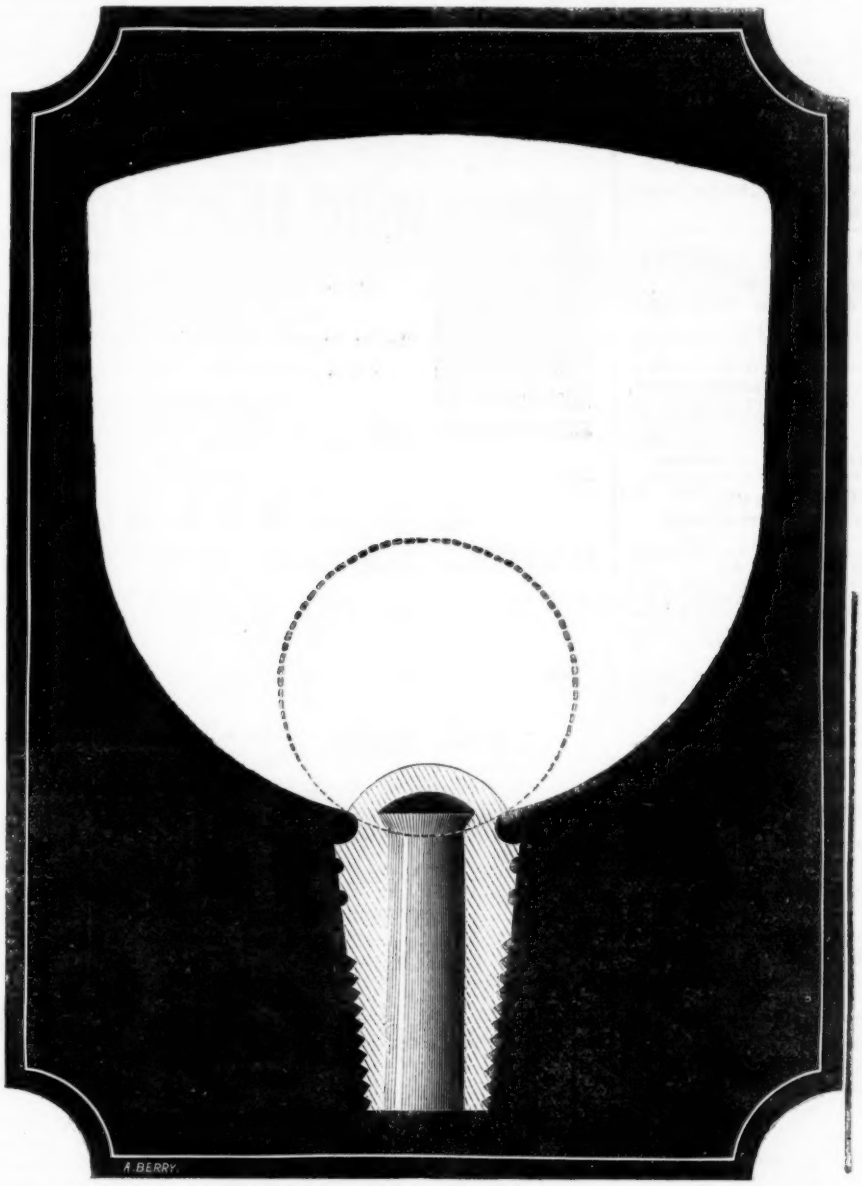
# THE ORIGINAL
## CIRCULAR-SLIT HOLLOW-TOP
# FLAT-FLAME BURNER.

INVENTED 1868.

**Improvements on this Burner have been made and secured by Two subsequent Patents.**

**Admirably suited for Public or Private Lighting.**




**Unrivalled for Brilliancy and Economy.**

Gives the Highest Result, per Cubic Foot, of any Flat-Flame Burner in the Market. These Burners are made of steatite—a material not affected by Heat, Water, or Acid.

I would call special attention to the fact, although, as apparatus for the production of very powerful lights by the use of ordinary gas, these Burners were first in the field, yet my exertions to bring them up to the highest standard of excellence have been so successful that, notwithstanding my opponents having had the immense advantage of carefully studying my productions in action for a considerable period, and of even closely copying them, they have not yet succeeded in producing anything to equal them.

**For Prices and Particulars, apply to**

# WILLIAM SUGG,
## *ENGINEER,*
## 2, GRAND HOTEL BUILDINGS, CHARING CROSS;
VINCENT WORKS, WESTMINSTER, S.W.

# C. & W. WALKER'S
## WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
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ESTABLISHED IN 1860.

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## GAS PURIFIERS & SCRUBBERS.

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## TROTTER, HAINES, & CORBETT,
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FIRE CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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ALFRETON IRON-WORKS, DERBYSHIRE,
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Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

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## GEORGE'S
## Patent Gas Calorigen,
A STOVE FOR
WARMING AND VENTILATING.
RECOMMENDED BY DR. RICHARDSON.

MANUFACTURERS:
J. F. FARWIG & CO.,
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## JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
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DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

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Gold Medal Awarded, Paris Exhibition, 1878.

## THOMAS TURTON AND SONS,
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MANUFACTURERS OF
## FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
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For Heating only.

## RITCHIE'S
GAS OR OIL
HEATING AND LIGHTING
## STOVES.

*Silver Medals awarded at Wolverhampton Exhibition*, 1878; *and Brussels International Exhibition*, 1880.

No Injury to Pictures or Plants.
No Flue.
No Danger from Fire.
No Offensive Smell.
Light and Warmth combined.
Cost less than other Fuel.

Messrs. RITCHIE & Co. are prepared to supply these Stoves on the best possible terms to Gas Companies to let out to their Consumers on the hire system.
Prices from £3 3s. to £10 10s.
*Full Particulars and Testimonials forwarded on application to*
RITCHIE & CO.,
23, ST. SWITHIN'S LANE, LONDON, E.C.

For Light & Heat.

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## R. DEMPSTER AND SON'S

## WOOD SIEVES FOR PURIFIERS,
WITH TAPER OR PARALLEL BARS,
MADE BY SPECIAL MACHINERY.
SCRUBBERS FILLED WITH BOARDS,
On our approved principle, for the extraction of Ammonia.
*Prices on application. References to First-Class Engineers.*
ROSE MOUNT IRON-WORKS,
ELLAND, NEAR HALIFAX.
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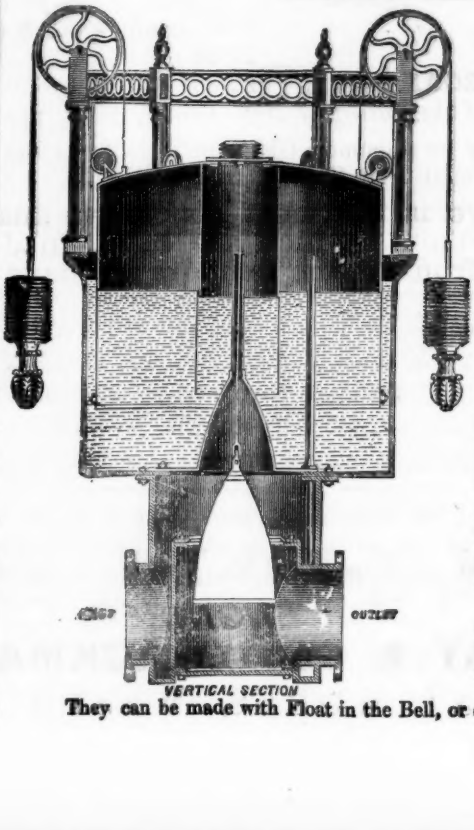
## J. & J. BRADDOCK,
## GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET AND DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
ROUND STATION-METERS,
ON CAST-IRON STANDS;
SQUARE STATION-METERS,
WITH PLANED JOINTS.

Messrs. BRADDOCK beg to submit to Gas Engineers their
## PATENT COMPENSATING GAS GOVERNOR,
Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 30-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

*The understated declaration, with which we introduced our apparatus when the Argand system was in the full tide of its fame, has been fully borne out by general experience, namely—*

**"THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING; and, 'in actual use,' yields as much light with Common Gas, and more with Cannel Gas, than any Argand System."**

---

CHARLES HUNT, Esq. (President of the British Association of Gas Managers), in his Inaugural Address to the members at their annual meeting, held in London, June, 1880, said: "Rivalry has stimulated into being, for outdoor purposes mainly, Burners of large power, that have fully maintained the superiority of coal gas over the electric light. To Mr. Bray our thanks are due for his development of the FLAT-FLAME BURNER into a lighting medium of a very high order, *and for his vindication of its claims to practical consideration.*"

**The above declaration was received with marked applause by the crowded meeting.**

---

# BIRMINGHAM LAMP TESTS.

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

## ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candles power Lanterns of medium lighting power have been fixed; **SINCE WHICH WE HAVE RECEIVED ORDERS FOR TWENTY-SIX MORE.**

*The apparatus used in the above tests were all of our usual medium lighting power class, and the tests showed that we sacrifice a considerable amount of lighting power for general efficiency. The tests further showed that our* 80*-candles* HIGHEST *lighting power burner yielded* 3·51 *candles per foot of gas—the quality being* 16·75 *candles* (3·35 *per foot*) *by the standard—which was a higher result than that yielded by any other flat-flame burner, though copies of our Slit-Unions, enlarged and improved by us Jan.,* 1879, *were used by our competitor; and higher than the* 80*-candles power Argands.*

---

THE BRITISH ASSOCIATION OF SCIENCE REPORT (1878) on "*The Best Means for the Development of Light from Coal Gas of Different Qualities*" showed that of all the two or three score Burners reported upon for Cannel Gas (which included all Burners of repute in the market), BRAY'S YIELDED THE GREATEST AMOUNT OF LIGHT, and had the fewest defects, such as "smokes," "blows," &c., recorded against them, and were the lowest in price.

*The Highest Results obtained by the Burners of the parties here named were—*

| | | | |
|---|---|---|---|
| **BRAY'S FLAT-FLAME** . . . . . | **28·6** | **candles per 5 cubic feet of Gas.** | **Quality of Gas by Standard Burner, 26 Candles.** |
| **SUGG'S** ditto . . . . . | **25·56** | " " " | |
| **SUGG'S DOUBLE-RING ARGAND** . . | **23·33** | " " " | |

[See *Journal of the Society of Arts*, Feb. 7, 1879, pp. 184, 187, and 189.]

The Report on Burners for Common Gas (1880) confirms the above unparalleled testimonial, by again placing us at the head of all Flat-Flame Burner Makers.

**NOTE.—The above is the most conclusive answer to the ever-changing and misleading statements which are being made by our competitor, with the object of taking from us the honours we have secured in open contest.**

---

**Extract from the *Leeds Mercury*, April 1, 1880.**

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

**Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.**

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

**[The above Lamps have Meters attached.]**

---

BRAY'S LANTERNS have been adopted by the Vestry of St. George, Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting. Also more than 70 Towns and Vestries have adopted them, after a similar competition in most cases; and many private users. In all cases they are a pronounced success.

---

**GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.**

*Nov.*, 1880.

THE

# MANN & WALKERS' PATENT SCRUBBER.

**Extensive use.** The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

**Small quantity of Water required.** By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

**Residual Product obtained.** The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

**Illuminating power increased.** The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

**Small amount of power required.** The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

**Beckton Gas-Works.** There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

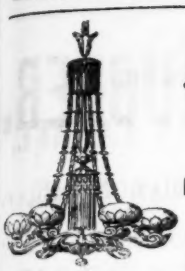
**Reserve purifying power contained.** There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

**Internal Materials not changed.** The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

**Guarantee** They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

**C. & W. WALKER.**

8, *Finsbury Circus, London, E.C.*



**F. & C. OSLER,**

**45, OXFORD STREET, LONDON, W.**

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

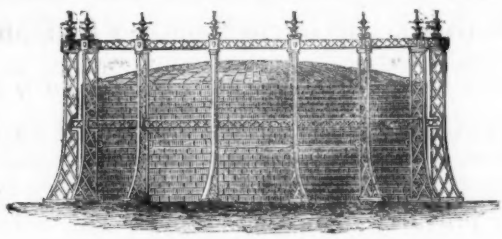
ESTABLISHED 1807.

**MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,**

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

**TABLE GLASS OF ALL KINDS.**

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



**THE HORSELEY COMPANY,**

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

**GAS OR WATER WORKS;**

ALSO

**MAKERS OF ROOFS, BRIDGES, &c.**

**GEORGE ORME & CO.,**

**ATLAS METER-WORKS, OLDHAM,**

MANUFACTURERS OF

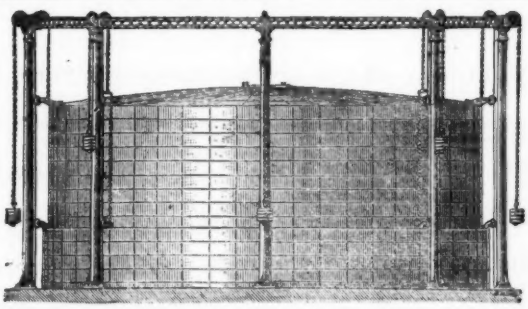
**WET AND DRY GAS-METERS,**

**STATION-METERS, GOVERNORS,**

**PRESSURE AND EXHAUST REGISTERS,**

LAMP-METERS IN CAST-IRON BOXES,

**And every Description of Gas Apparatus.**



**J. T. B. PORTER & CO.,**

GAS ENGINEERS & MANUFACTURERS,

**IRONFOUNDERS AND CONTRACTORS,**

**GOWTS BRIDGE WORKS,**

**LINCOLN.**

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

**T. NEWBIGGING,**

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

**HENRY LYON,**

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

**ALFRED LASS,**

Fellow of the Institute of Chartered Accountants,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

*Accounts Analysed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.*

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

**JOHN ROMANS, C.E., F.G.S.E.,**

CONSULTING GAS ENGINEER

AND

**CANNEL COAL FACTOR,**

**30, St. Andrew Square, EDINBURGH.**

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

**THOMAS PROUD,**

BROOKFIELD WORKS,

**103, ICKNIELD ST., BIRMINGHAM,**

MANUFACTURER AND ERECTOR OF

**PLANT FOR SULPHATE OF AMMONIA,**

ALSO MANUFACTURER OF

**WOOD GRIDS**

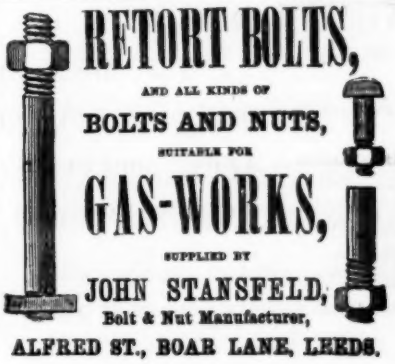
FOR

**PURIFIERS AND SCRUBBERS.**

**BOX'S PATENT STREET GAS-LAMP**

Has the following good qualities:—1. No putty or other material is required for glazing. Thus there is no hacking out of old putty on removal of the glass, with the *consequent damage* to the lamp frames. 2. No liability to breakage by unequal expansion of the glass caused by changes of temperature. 3. Any inexperienced workman can glaze the lamp in a few minutes. 4. The system of glazing can be applied to any existing lamp at a trifling cost. 5. It is cheap, strong, and durable. 6. The glass can be easily removed so that the frames can be thoroughly painted inside and out.

The lamp may be supplied fitted with clear opal or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing lamps to this system can be supplied at moderate prices and a small charge for royalty. Licences granted on the most reasonable terms. For further particulars apply to the Patentee, W. W. Box, Gas-Works, Crayford Kent.



**RETORT BOLTS,**

AND ALL KINDS OF

**BOLTS AND NUTS,**

SUITABLE FOR

**GAS-WORKS,**

SUPPLIED BY

**JOHN STANSFELD,**

Bolt & Nut Manufacturer,

**ALFRED ST., BOAR LANE, LEEDS.**

## ROBERT MARSHALL,

**CANNEL COAL MERCHANT,**

198, ST. VINCENT STREET, GLASGOW.

TREES BOGHEAD.

SHOTTS BOGHEAD,

And all the first-class Scotch Cannels.

*Prices and Analyses on application.*

## HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

**W. RICHARDSON,**

**29, QUAYSIDE, NEWCASTLE-ON-TYNE.**

**GAS COAL.**

**POPE & PEARSON, LIMITED,** have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LOFTHOUSE, West Riding and Silkstone Collieries, near LEEDS.

**GAS COAL.**

**THE MIRFIELD COAL COMPANY** are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analysed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67-*candle gas, with* 1450 *lbs. of good Coke, per ton.* Ash in Coke, 1·85.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON.

London Agent: Mr. F. J. LEE SMITH, Bromley, KENT.

## HUCKNALL TORKARD CANNEL.

The HUCKNALL COLLIERY COMPANY can offer a Cannel producing a considerable quantity of Gas of good quality.

For analysis and price apply to the Company at their

**HUCKNALL TORKARD COLLIERIES,**

NEAR NOTTINGHAM.

## LIVESEY FIRE-CLAY WORKS,

**NEAR BLACKBURN, LANCASHIRE.**

(ESTABLISHED 1835.)

## ORLANDO BROTHERS,

LIMITED,

**MANUFACTURERS OF**

**PATENT CLAY RETORTS,**

AND EVERY DESCRIPTION OF

**TUBULAR GLAZED SEWERAGE PIPES,**

BENDS, JUNCTIONS, &c.

*Fire-Bricks, Tiles, Blocks, and Chimney-Tops.*

## IMPORTANT to GAS COMPANIES.

**ENORMOUS SAVING.**

JOHN ABBOT & CO., LIMITED,

OF SUFFOLK LANE, LONDON, AND GATESHEAD,

Manufacture and Erect

HYDRAULIC CRANES

For Discharging Coal Barges;

WAGGON HOISTS

For Lifting Coals to Retort-House Stageway:

CAPSTANS

For Moving Trucks about the Yard,

And Apparatus for Lifting PURIFIER COVERS.

*Examples to be seen at Beckton, Hull, &c., &c.*

## WILLIAM MACLEOD & CO.,

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**CAST-IRON GAS AND WATER PIPES.**

**Sole Agents in Scotland for the Torbay Paint Co.**

***Prices on application.***

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AGENT FOR

**THOMAS BARR'S LESMAHAGOW MAIN CANNEL,**

AND

**NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.**

**Analyses and Quotations on application.**

## WILSON CARTER AND PEARSON,

**GAS COAL AND CANNEL FACTORS,**

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

**Address—CHIEF OFFICES.**

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

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GAS AND CONSULTING ENGINEER,

**35A, GREAT GEORGE STREET,**

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**PATENTEE and MANUFACTURER of the following Inventions:—**

**RETORT SETTINGS—giving great Economy of Fuel.**

**STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.**

**FUEL-MACHINE, for Compressing Breeze and Tar.**

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the AUTHOR; or at the Office of the "JOURNAL OF GAS LIGHTING."

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

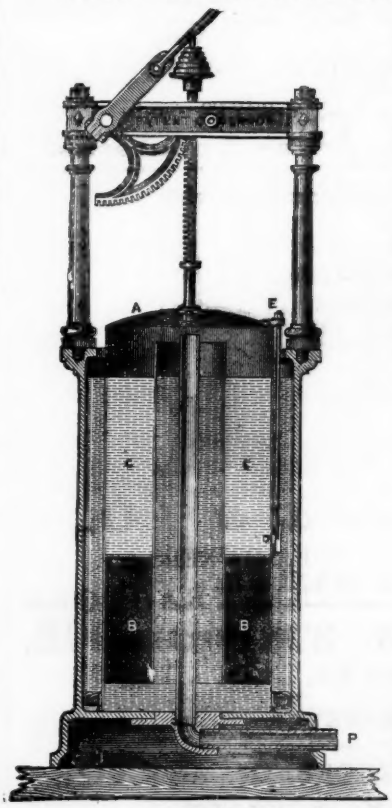
**35a, GREAT GEORGE STREET, WESTMINSTER, S.W.**

## GEORGE WALLER & CO.,

GAS AND HYDRAULIC ENGINEERS,

**Patent Compensating Steam Governor,**

WITH SELF-CONTAINED WATER-BALANCE.




This is the most efficient and perfect Governor yet made to control and regulate the speed of Engines and Exhausters according to the varying make of gas, and maintain a steady gauge, whether working level or with six inches of seal.

It is the only Governor that will effectually control Condensing and Compound Engines, especially when the Exhauster is on light work, and the Engine is large.

During the drawing and charging of Retorts, the Engine requires no attention—a matter of great importance in small works.

Descriptive Circular sent on application.

They are in use at

BECKTON,
HAMPTON WICK,
DUKINFIELD,
HARTLEPOOL,
NEWCASTLE-ON-TYNE,
RAMSGATE,
SUTTON,

and about 30 other works.

G. W. and Co. make **special Steam Throttle Valves,** suitable for working with this Governor, and alter existing Throttle Valves to same plan.

*See also advertisement, page* 901.

**PHŒNIX ENGINEERING WORKS,**

**Holland Street and Bear Gardens, Southwark, S.E.**

# OXIDE OF IRON

FOR THE

## PURIFICATION OF GAS,

SUPPLIED DIRECT FROM THE

## IRONSTONE MINES OF THE PROPRIETOR.

**THIS OXIDE IS GOOD IN QUALITY AND LOW IN PRICE.**

ADDRESS ALL INQUIRIES TO THE SOLE AGENT—

## ALBERT USHER,

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## ALDWARKE MAIN AND CAR HOUSE COLLIERIES,

Near ROTHERHAM.

**JOHN BROWN & CO., LIMITED,**

**ATLAS STEEL AND IRON WORKS, SHEFFIELD.**

PROPRIETORS.

The Aldwarke Main Brights is a first-class gas-making and coking Coal, yielding by analysis 12,600 feet of 19-candle gas per ton, and giving "Weight of illuminating matter in lbs. of sperm, 820·80." It is very free from impurities and foreign matter.

*Copies of Analyses made by Gas Companies who have used it will be forwarded and Samples sent on application.*

---

**GAS COAL. GAS COAL. GAS COAL.**

**WELLS, BIRCH, RYDE, and CO., Limited,**

## HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

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## THE WIGAN COAL & IRON COMPANY,

LIMITED.

MIDLAND DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: A. C. SCRIVENER,

**Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.**

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

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## LONDONDERRY GAS COALS

DIRECT FROM THE

**MARQUESS OF LONDONDERRY'S COLLIERIES.**

COUNTY OF DURHAM.

For Prices and Particulars, apply to

MR. S. J. DITCHFIELD,

LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.

London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.

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## CANNEL AND GAS COALS.

THE DUKINFIELD COAL AND CANNEL COMPANY are prepared to deliver, to any Station, their Celebrated GAS COALS, which have a very high reputation for quantity of Gas and Illuminating Power, and make a First-class Coke.

Analyses and terms of delivery may be obtained by communicating with the above Company, at their Offices,

**DUKINFIELD, NEAR MANCHESTER.**

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## JOHN HALL AND CO., STOURBRIDGE,

**Manufacturers of FIRE-BRICKS, LUMPS, TILES,**

**AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.**

**N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.**

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WOOD

**TROUGHING**

For Preserving Service-Pipes.

In any Lengths.

**THOS. PROUD,**

**Brookfield Works, Icknield St., Birmingham.**

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**BELGIAN CLAY RETORTS.**

**J. SUGG and CO., late ALBERT** KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

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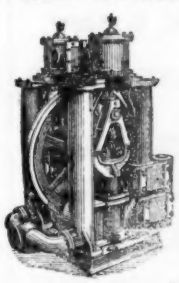
## John Cameron's Specialities



ARE HIS

PATENT LEVER

**PUNCHING MACHINES**

AND HIS

**STEAM-PUMPS**

FOR

**GAS-WORKS,**

Feeding Boilers, Steam Fire-Engines, Colliery Deep Lifts, Irrigation, Contractors, and Chemical purposes.

WORKS:

**OLDFIELD ROAD, SALFORD, MANCHESTER.**

# NEW PATENT WET GAS-METER,

## THE "RELIANCE,"

MANUFACTURED BY THE

## GAS-METER COMPANY, LIMITED,

**238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.**

SOLE AGENT FOR SCOTLAND: JAMES KEITH, EDINBURGH AND ARBROATH.

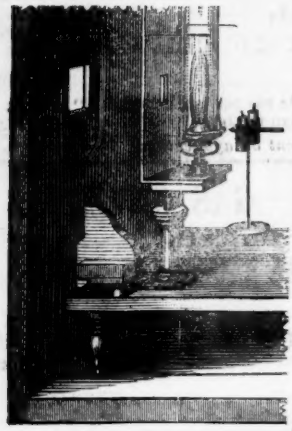
The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,

**238, KINGSLAND ROAD, LONDON.**



ERRORS IN THE PHOTOMETRIC ESTIMATION OF THE VALUE OF GAS

are AVOIDED by the use of

**METHVEN'S**

## ILLUMINATING POWER STANDARD.

The Illustration shows the application of the METHVEN STANDARD to a LETHEBY PHOTOMETER, with provision for the use of candles in the most approved manner.

**All STANDARDS will, in future, be numbered, and be accompanied by a certificate signed by Mr. Methven and by our Manager, Mr. F. W. Hartley.**

Prices and particulars to be obtained from the

**Sole Authorized Makers,**

## ALEXR. WRIGHT & CO.,

**55, 55a, and 56, MILLBANK STREET, LONDON, S.W.**

# R. LAIDLAW AND SON,

**EDINBURGH** AND **GLASGOW.**

*Manufacturers of*

**CONSUMERS IMPROVED WET GAS-METERS,**

THE UNVARYING WATER-LINE GAS-METERS,

**IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;**

**STATION-METERS, ALL SIZES, with PLANED JOINTS;**

**Experimental Meters, Photometers, Pressure-Gauges, Governors, Test Holders, &c., &c.**

LONDON OFFICE:

## 6, LITTLE BUSH LANE, CANNON STREET, E.C.

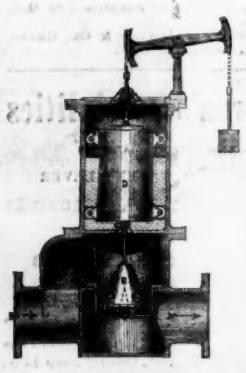
# PEEBLES'S

## PATENT GAS GOVERNORS,

FOR

Stations, Districts, Public Lamps, & Dwelling-Houses,

Are meeting with increasing favour, and giving full satisfaction where they are in use.



Patent Safety Station-Governor.

**Wet and Dry Gas-Meters of Superior Excellence, Station-Meters, &c.**

*Prices and Illustrations Post Free on Application.*

## D. BRUCE PEEBLES & CO.,

TAY WORKS, BONNINGTON, EDINBURGH.


London: Printed by WALTER KING (at the office of Clayton & Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, December 7, 1880.